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CERTIFIED FOR PARTIAL PUBLICATION*

IN THE COURT OF APPEAL OF THE STATE OF CALIFORNIA

FIFTH APPELLATE DISTRICT

THE PEOPLE, Plaintiff and Respondent, v. MICHAEL ANTONIO PIZARRO, Defendant and Appellant.	F057722 (Super. Ct. No. M8517) **OPINION**

APPEAL from a judgment of the Superior Court of Madera County. Edward P. Moffat II, Judge.

Cliff Gardner, under appointment by the Court of Appeal, for Defendant and Appellant.

Kamala D. Harris, Attorney General, Dane R. Gillette, Chief Assistant Attorney General, Michael P. Farrell, Assistant Attorney General, Stephen G. Herndon and Rachelle A. Newcomb, Deputy Attorneys General, for Plaintiff and Respondent.

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* Pursuant to California Rules of Court, rules 8.1105(b) and 8.1110, only the Introduction; Procedural Summary; Facts; the following parts of the Discussion: I., II.A., II.E.1.a., II.E.1.e., II.E.1.f., II.E.2.a., II.E.2.f., heading of II.E.5., and II.E.5.f.; and the Disposition of this opinion are certified for publication.

INTRODUCTION

Tragically, in 1989, 13-year-old Amber Dawn Barfield was sexually assaulted and murdered. In 1990, defendant Michael Antonio Pizarro, Amber's older half-brother, was convicted of her first degree murder with special circumstances. In the first appeal in 1992, this court reversed and remanded for a *Kelly*[1] hearing regarding the DNA[2] evidence. On remand, the trial court ruled that the DNA testing was generally accepted within the scientific community and reinstated the conviction. In the second appeal in 2003, this court found that the scientific evidence failed to satisfy the third prong of *Kelly* and reversed the judgment. In 2008, a second jury convicted defendant of first degree murder with a special circumstance finding. This is the third appeal in this case. Defendant again raises challenges to the DNA evidence, contends the trial judge erred in denying his motion for a new trial based on jury misconduct, and argues unanimity was required on the murder theory.

After the second trial verdicts were received and the jury had been discharged, the parties and trial court learned that Juror No. 9 had read, during the trial, an earlier appellate opinion in this case.[3] That opinion revealed several items of information that were not presented during the second trial, including: defendant had previously been convicted on all counts by another jury; defendant had been sentenced to life in prison without the possibility of parole; the appellate court's review of the evidence established that defendant had consumed beer throughout the afternoon and continued to drink at a

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1 *People v. Kelly* (1976) 17 Cal.3d 24 (*Kelly*) (three-prong test must be satisfied before scientific evidence derived from new scientific procedures may be admitted).

2 Deoxyribonucleic acid.

3 The opinion Juror No. 9 read was actually an opinion issued in August 2002 that was later vacated after this court granted rehearing. It subsequently issued its opinion in 2003 (*People v. Pizarro* (2003) 110 Cal.App.4th 530 (*Pizarro II*), disapproved on other grounds in *People v. Wilson* (2006) 38 Cal.4th 1237, 1250-1251). There is no substantive difference between the two opinions as it relates to the jury misconduct issues.

party; defendant testified at his first trial in which he contradicted portions of his statement to the police and admitted that "alcohol made him violent"; the Federal Bureau of Investigation (FBI) analysis presented at the first trial concluded that the DNA from the semen on the vaginal swabs matched the known blood sample of defendant; the case had been appealed twice; and the appellate court determined that the evidence against defendant was a "'strong circumstantial case'" and that the DNA evidence clearly """sealed [his] fate.""" (*Pizarro II*, *supra*, 110 Cal.App.4th at pp. 553, 634.)

During the second trial, the trial judge regularly admonished the jury not to consider anything other than the evidence presented in the courtroom. Juror No. 9 repeatedly violated that instruction during the trial. The parties and the trial court agree that Juror No. 9 committed misconduct. They disagree whether that misconduct amounted to juror bias, warranting a new, and third, trial.

We sympathize with the trial judge who, having presided over two jury trials and a prolonged *Kelly* hearing amid two appeals, was called upon to make the difficult decision of whether to grant yet another new trial in a case that was then almost 20 years old. The trial court ultimately denied defendant's new trial motion, finding it to be a "close case" and a "real hard, hard decision to make." While we agree with the trial judge that the juror misconduct in this case amounted to "gross misconduct" and was "absolutely outrageous," we disagree with his decision denying the new trial motion. We conclude that reversal is required. Despite the good efforts of the trial judge and the attorneys to conduct the trial in accordance with the rules of evidence, procedure, and substantive law, the juror's misconduct in disobeying the court's repeated admonitions and in investigating the case on his own made a mockery of the trial process and prejudiced defendant. We view that juror's behavior in this case as criminal.[4]

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[4] Juror No. 9 arguably violated Penal Code section 96 (juror commits felony if he or she willfully and corruptly receives information except according to the regular course of proceedings) and could have been criminally prosecuted for his misconduct. (See *In re*

We conclude that the extraneous material (the appellate opinion) read by Juror No. 9, judged objectively, is inherently and substantially likely to have influenced the juror, warranting a new trial. Accordingly, we reverse the conviction.

We are mindful of the burdens—in terms of time, money and proof —of any prospective retrial of this case involving an awful crime that occurred 24 years ago. In this third appellate opinion on a case that has been twice tried, we take no satisfaction in the decision we unavoidably must render, in accord with our duty, as a consequence of a juror's outrageous misconduct that undermines the soundness of a verdict in our system of justice.

Although we uphold the admission of the DNA evidence, we conclude that the widely held belief that allelic dropout cannot cause false results in a criminal case as long as the defendant's and the perpetrator's DNA samples are tested in a consistent manner is based on the improper assumption that the defendant *is* the perpetrator—in other words, that the defendant is guilty. We determine in this case, however, that any error was harmless.

PROCEDURAL SUMMARY

On August 11, 1989, the Madera County District Attorney charged defendant as follows: count one, first degree murder (Pen. Code, § 187) with the special

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Carpenter (1995) 9 Cal.4th 634, 673 (Mosk, J., dis. opn.) (*Carpenter*).) We believe a juror who so brazenly disregards and willfully violates the court's admonition not to investigate or consider matters outside the evidence received in the courtroom should be criminally prosecuted. Jurors take an oath to follow the court's instructions. When a juror knowingly disobeys a court order, he or she should be held accountable. We recommend that the Advisory Committees on Criminal Jury Instructions and Civil Jury Instructions include in their Pretrial Instructions a reference to Penal Code section 96 to impress upon jurors the seriousness of their task and the importance of obeying the court's instruction not to investigate the case or consider matters other than the evidence received in the courtroom. One wonders if Juror No. 9 would have committed this misconduct if he was told it could subject him to criminal prosecution.

circumstances that the murder was committed while defendant was engaged in the crime of rape (Pen. Code, § 190.2, subd. (a)(17)) and while he was engaged in the crime of a lewd or lascivious act upon a child under age 14 (Pen. Code, § 190.2, subd. (a)(17));[5] count two, forcible lewd or lascivious act on a child under age 14 (Pen. Code, § 288, subd. (b)); and count three, forcible rape (Pen. Code, § 261, subd. (2)). Defendant pled not guilty.

In 1990, a *Kelly* hearing was held to determine the admissibility of the results of DNA identification evidence. The trial court ruled the results were admissible.

The jury found defendant guilty on all counts and found true the special circumstances. The trial court sentenced defendant to life in prison without the possibility of parole on count one, to be served consecutively to the upper term of eight years on count two. The sentence on count three was stayed pursuant to Penal Code section 654.

On appeal, we remanded the case to the trial court for a full-blown *Kelly* hearing to determine the general scientific acceptance of the FBI's DNA profiling procedure and the FBI's Hispanic database. (*People v. Pizarro* (1992) 10 Cal.App.4th 57, 95-96 (*Pizarro I*).) In March 1998, after a hearing conducted in 1994 and 1995, the trial court found the procedure and the database generally accepted and the evidence admissible. Defendant appealed. In 2002, we published an opinion reversing the judgment. We

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5 In 1989, Penal Code section 190.2, subdivision (a)(17) provided: "(a) The penalty for a defendant found guilty of murder in the first degree shall be death or confinement in state prison for a term of life without the possibility of parole in any case in which one or more of the following special circumstances has been charged and specially found under Section 190.4, to be true: [¶] … [¶] (17) The murder was committed while the defendant was engaged in or was an accomplice in the commission of … the following felonies: [¶] … [¶] (iii) Rape in violation of Section 261. [¶] … [¶] (v) The performance of a lewd or lascivious act upon [the] person of a child under the age of 14 in violation of Section 288…."

granted rehearing, and then in 2003, we published a final opinion in *Pizarro II, supra,* 110 Cal.App.4th 530, reversing the judgment.

In 2008, a second jury found defendant guilty on count one, first degree murder with the special circumstance that the murder was committed while defendant was engaged in the crime of a lewd and lascivious act, but the jury found not true the special circumstance that the murder was committed while defendant was engaged in the crime of rape. The jury found defendant guilty on count two, forcible lewd or lascivious act on a child under age 14. On count three, the jury found defendant not guilty of rape, but guilty of the lesser included offense of statutory rape.

Defendant unsuccessfully moved for a new trial. The trial court sentenced defendant to life without the possibility of parole on count one, a stayed eight-year term on count two, and a stayed three-year term on count three. Defendant appealed.

FACTS

On June 10, 1989,[6] defendant and his wife, Sandy, both about 20 years old, and their five-month-old baby drove to North Fork from Clovis in their white Toyota pickup truck to visit defendant's mother, Chris Conston, and his sisters.[7] Defendant and Sandy did not visit North Fork often; as far as Sandy knew, defendant had not been there in the several weeks prior to this visit, and the last time she had been there was in late 1988.[8] The drive to North Fork took about 45 minutes and they arrived at Chris's house around noon. Defendant's sisters, Gloria, Amber, and Angie, who still lived at home, were there, as well as Gloria's boyfriend, Billy, who was about 17 years old. After they visited for a

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[6] All references to dates are to 1989 unless otherwise noted.

[7] Defendant and Sandy married in September 1987 and divorced in October 1997.

[8] Defendant worked at a lumber mill in Auberry, about 30 minutes from home in Clovis. If he was working on a Saturday, he would stay in Auberry after work on Friday and come home after work on Monday. Sandy did not remember his being gone from home during the week prior to June 10.

while, everyone went to the elementary school to watch the men play basketball. Sandy knew defendant and other people were drinking because they were "just overly happy." After the basketball, they returned to the house. During the remainder of the day, defendant left the house three times without Sandy. He did not tell Sandy where he was going, but she assumed he was going to the store. After his third trip, he told Sandy his friends were going to a party and he wanted to go. Sandy told him she wanted to go home, but they ended up going to the party at Shady Oak trailer park a few miles up Road 200, which was a two-lane mountain road with lots of trees, steep embankments, and no streetlights.

When Sandy and defendant arrived at the party, Amber, Gloria, and Billy were already there. In total, there were about eight people at the party, one of whom was Scott Nelson. Sandy talked with Amber while defendant drank beer and hard liquor with his friends. Sandy did not drink much because she was nursing the baby. She may have had one-half of a beer. She was not happy to be there. She thought defendant seemed to be handling his alcohol "okay." He was a regular drinker and she had seen him in various stages of intoxication in the previous couple of years.

At about 10:00 or 10:30 p.m., Amber left the party with Billy and Gloria. Sandy asked defendant to leave, but he refused.

At about 12:30 a.m., Sandy took the baby and left for home in the truck. She drove only a few minutes to Bass Fork Market, then decided she did not want to drive by herself, so she returned to the party. Defendant came outside and they argued for five or 10 minutes about going home. Defendant went back inside for about 20 minutes and came back out around 1:00 a.m.

Defendant was angry with Sandy and he started walking toward Road 200, which was about 100 feet away from the trailer. He told Sandy he was going to his mom's. He had been drinking, but he was not staggering, falling down, or slurring his words. Sandy got into the truck with the baby and followed defendant down the road toward North

Fork. He was zigzagging across the road, walking from one side to the other and hiding behind trees and rocks. He appeared to be hiding from Sandy. At one point, he ran up an embankment on the side of the road, then back down to the road. Eventually, he started running on the road. He hit the hood of the truck and told Sandy not to stop in the middle of the road. As she followed him, she yelled at him to get in the car. She told him she just wanted to go home. Sandy had seen him intoxicated before, but she had never seen him act this way. This continued for more than 15 minutes, until Sandy gave up and drove into North Fork to Chris's house. She knocked on Chris's front door and eventually Amber opened the door. Sandy told her defendant was "out there" and she could not get him in the truck because he did not want to come. Amber said, "[W]ell, let's go get him." Sandy told her to ask her mom. Amber left and returned with Chris, who gave Amber a turquoise flashlight and told them to be careful.

Amber got in the truck and held the baby. Sandy drove back to the place she had last seen defendant. When they saw him walking, Sandy made a U-turn. They followed him and told him to get in the car, but he refused. He went up a hill and Sandy shined the flashlight on him. He came down and started running. Amber got out of the truck and set the baby on the seat, leaving the door slightly open. Sandy saw Amber in the headlights as she walked across the road toward defendant. Sandy picked up the baby and pulled the door closed. She followed Amber for about 10 seconds. After that, defendant and Amber disappeared. Sandy never saw Amber again.

Sandy drove forward. She held her door open as she yelled for defendant and Amber because the driver's window was not operable. She heard nothing. It was dark and she could see nothing other than what her headlights illuminated. She yelled for defendant and Amber to turn on the flashlight, flash the light, or do something. Then she saw a flash of light behind a bush. The light pointed upward. Sandy closed her door, pulled forward, and made a U-turn. She stopped in front of the bush and yelled. She was holding the baby, so she could only yell from her open door, which was now on the

opposite side of the truck from the bush. There was no response and no more light, so she pulled forward, made another U-turn, and returned to the spot where she had seen the flash of light. She parked, opened the door, and yelled for defendant and Amber. She heard "a scream, a muffled sound, and nothing else." It was as if someone put a hand over a mouth. It scared her and "[f]reaked [her] out." She closed her door and immediately drove back to Chris's house. She told Chris, "I don't know what happened. I heard a scream, a muffled sound. I'm scared. I don't know what's going on." Chris told her to come in and they called the sheriff's department. Deputy Loring was on duty that night and he received the call around 2:50 a.m.

Sandy drove to Sierra Automotive at the intersection of Roads 200 and 222 to meet the deputies. Deputy Loring and Deputy Weisert arrived and met Sandy in the parking lot. Sandy was sitting in the white truck with the baby and she seemed upset and frightened. She told them what had happened and they began searching for defendant and Amber. Sandy's parents came from Fresno to take her home. Sandy left the white truck at Chris's house.

Just before 6:00 a.m., defendant arrived back at Chris's house. At about 6:00 a.m., defendant called Deputy Weisert at the station. According to Deputy Weisert, defendant did not seem intoxicated. He said his sister was missing. He explained that he got into an argument with Sandy. His sister came looking for him and he told her he did not want to talk about it. He took off up the hill with her flashlight. She yelled at him about the flashlight and he threw it down the hill. He did not go back down, but later woke up in the bushes and started walking home. As he did, "some cops came upon him and accused him of kidnapping his sister. And then … he basically ran home and was followed by the cops." He did not describe these cops to Deputy Weisert. But she and Deputy Loring had been the only officers on duty that night, and after Deputy Loring left around 4:00 a.m., Deputy Weisert was the only officer on duty. The next officer would not come on duty until 6:45 a.m. In Deputy Weisert's opinion, defendant was telling her a story

that could not be true. She knew that no other officers were on duty in the area and that they would not have known about the case anyway.

At about 8:00 a.m., Deputy Lidfors went to Chris's house to speak to defendant. He was asleep, so Deputy Lidfors asked Chris to wake him up. When they spoke, defendant did not seem intoxicated or hung over; nor did he smell of alcohol. Defendant looked as if he had just woken up from sleeping out in the brush. He was wearing the same clothes he had worn the previous night, a white tank top and black and grey Oakland Raiders shorts. He was dirty and there were "stickers, grass stuff sticking off of his shorts." Defendant told Deputy Lidfors what had happened. When Deputy Lidfors asked defendant if he could give him a description of where he had last seen Amber, defendant directed him to a specific area on the side of Road 200.

Relying on that information, at about 8:30 a.m., officers found Amber's body about 16 feet from the shoulder of Road 200.[9] The area was a mixture of grass and weeds with a lot of dirt. The grass was trampled down. Amber was nude below the waist, except that she was still wearing short dark socks. Her blue panties were down around her right ankle. Much of her body was covered in foxtails. Her right sock had foxtails on the ball and toe portion, and a large amount of dirt caked onto the heel, as if it had been dug into the dirt. The other sock had foxtails and some dirt on it. A turquoise flashlight was near her right foot. Her tan T-shirt and bra were both pushed up over her breast. Her right cheek was bruised and marked. Blood was smeared along her stomach, down her inner left thigh, across her right thigh, and on her right wrist. Her hands were clutching a large amount of dirt, grass, and foxtails. Her pants and shoes were under some brush near her body.

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9 Earlier that morning, officers had not found Amber's body because Sandy mistakenly directed them to an area about one-tenth of a mile from the area she had seen the flashlight go on.

Detective Kern found evidence of activity only in the area where Amber was lying and in an area of dirt slippage on the embankment between the roadway and Amber. He found no evidence of activity either behind the crime scene up to the six-stranded barbed wire fence or on the other side of the barbed wire fence. Other than the dirt slippage area, he found no evidence of any entry to or exit from the crime scene.

Gary Cortner, a senior criminalist, and Richard Kinney, a latent fingerprint analyst, both from the Fresno lab of the California Department of Justice (DOJ), arrived to help Detective Kern process the crime scene.

At about 10:00 or 10:30 a.m., Sergeant Gauthier spoke to defendant at the station. The knuckles of defendant's right hand were somewhat red and there were some very minor scratches on one of his shoulders.

Around 1:30 p.m., Amber's body was removed from the scene and taken to the mortuary.

At about 2:00 or 2:30 p.m., Sergeant Gauthier took defendant back to Chris's house. As they drove on Road 200, defendant pointed to the crime scene area as the last place he had seen Amber.

Sandy returned to North Fork to talk to defendant at Chris's house. She noticed that one of his hands was bruised and swollen. Defendant often injured his hands at work, but she had not noticed this injury the previous day.

At about 4:00 p.m., Dr. Dalgleish, a pathologist, performed the autopsy on Amber's body at the mortuary.[10] He noted that the right side of Amber's face was bruised, most likely from blunt force trauma. In the middle of a prominent bruise below her eye was a small puncture wound, which might have been a source of external bleeding. These injuries were consistent with blunt force by a hand or a flashlight, although some of the injuries could have been caused by falling. She had bruising around

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10 Dr. Dalgleish testified as an expert in pathology.

her mouth and nose. Amber also suffered an internal hemorrhage in the scalp on the right front of her head, but no fractures of the skull or injuries to the brain. This scalp hemorrhage was consistent with blunt force by a fist or a flashlight, and could have dazed or disoriented Amber. These injuries were less than one day old and were all inflicted before death, but they were not fatal.

Amber's external genitalia showed no sign of injury. Her hymen was open, demonstrating some sort of sexual activity at some time prior to her death. It was impossible to determine when that had occurred. Her uninjured condition did not suggest that she had not been sexually assaulted, but only that any sexual assault was not aggressive enough to cause injuries.

Internally, Amber's neck area showed petechial hemorrhages, consistent with asphyxia hypoxia. There was no evidence of strangulation and no foreign material blocking the airways. Her lungs also suffered petechial hemorrhages, which resulted in congestive edema.

Dr. Dalgleish collected vaginal and rectal swabs and made slides from them. He allowed the swabs to dry for about two hours and 45 minutes, upright, separate from each other, and away from the body. He took blood samples from the large vein around the heart and put them in clean, sterile containers. He took scrapings from the dried blood smears on Amber's body and placed them in a plastic vial. The samples were placed in the victim sexual assault kit. Amber's blood tested negative for drugs and alcohol.

Dr. Dalgleish determined that Amber's death was caused by suffocation leading to asphyxia hypoxia. He believed the bruising around her mouth indicated pressure, such as from a hand over her mouth and nose, that prevented air from entering her airways. Generally, suffocation requires about five minutes of complete oxygen deprivation to cause irreversible brain injury. This would require a steady application of pressure.

Based on the state of rigor mortis, he estimated her death as occurring about 10 to 14 hours before the autopsy.[11]

On June 13, Detective Kern returned to Chris's house. He advised defendant of his *Miranda*[12] rights and defendant agreed to speak to him. After taking defendant's statement, Detective Kern and defendant drove to the crime scene. Defendant pointed out a tree about 150 yards from the crime scene where he had tried to hide when Sandy first brought Amber back to talk to him. Then he stopped Detective Kern at the side of the road adjacent to the crime scene. He pointed exactly to the crime scene and said it was where he spoke to Amber. He said he entered the area through the dirt slippage area. Defendant explained that after he and Amber finished talking, she wanted the flashlight back. He threw it to her, then turned and ran in the opposite direction of the roadway. The route he indicated would have been right through the barbed wire fence, which he did not mention. This was an area Detective Kern had searched and found no evidence of activity. Detective Kern then drove defendant to the area he said he went to sleep in the brush. Defendant said he ran straight from the crime scene through an open field and over a hill. He next showed Detective Kern the specific area that he spent the night. Detective Kern got out and examined the ground for about 50 yards, but found no tracks in the dirt, on the embankment, or on the roadway. He went to the top of the hill and examined a large area, but found no evidence that anyone had been there recently. Defendant had no response; he seemed not to remember where he had been.

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11 The defense expert agreed Amber's cause of death was most probably suffocation due to manual obstruction of the mouth and nose, probably by a hand. It was not due to her face being pushed into the ground because there would have been marks around the mouth and nose that were not present.

12 *Miranda v. Arizona* (1966) 384 U.S. 436.

1989 Lab Analysis

The physical evidence was immediately analyzed at the Fresno DOJ lab. (After analysis by the DOJ, described below, the vaginal swabs were sent to the FBI for Restriction Fragment Length Polymorphism (RFLP) DNA analysis. That DNA evidence was introduced in the first trial and discussed at length in *Pizarro II* (and the opinion read by Juror No. 9), but it was not mentioned in the second trial. The following testimony regarding what was done in 1989 was elicited at the second trial.)

Delia Frausto-Heredia received the victim sexual assault kit on June 12.[13] She examined the vaginal swab first, as was her practice. She examined only one of the four vaginal swabs, all of which were initially in an envelope together. She used good lab practices, including the use of gloves and sterile instruments, and she worked with this evidence only. The vaginal swab tested positive for the presumptive presence of sperm. Frausto-Heredia saved the remainder of the vaginal swab to ensure that the defense could reanalyze it.

Frausto-Heredia determined from the blood samples that Amber was a type O, a non-secretor, and a two plus one plus for phosphoglucomutase (PGM). Defendant was a type B, a secretor, and a one plus one plus for PGM. The PGM result of the blood scrapings from Amber's leg was consistent with Amber's own blood sample.

Stephen O'Clair, a senior criminalist, determined that the sperm on the vaginal swab was type B and therefore defendant was included as a possible donor.[14] About 10 percent of the general population are type B, and about eight percent are both type B and a secretor. O'Clair also used good lab practices and safeguards against contamination.

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13 Frausto-Heredia testified as an expert in serology.

14 O'Clair testified as an expert in ABO blood typing.

On June 13, Cortner examined the slides from the victim sexual assault kit.[15] He found about 20 to 25 sperm on a slide, along with some bacteria that were streaked with the sperm.

When Cortner examined photographs of the bruises on Amber's face, he observed some parallel lines fairly close together and wondered what could have made that pattern. He noticed that the turquoise flashlight's button had lines running across it and the word "Eveready" in the center. Cortner made an impression of the flashlight's button in clay and determined that the button could have caused the mark.

In Amber's pubic hair sample, Cortner found none of defendant's pubic hairs. Similarly, in defendant's pubic hair sample, he found none of Amber's pubic hairs. In about 50 percent of sexual assault cases, Cortner observed a lack of pubic hair transfer between victim and perpetrator.

On June 19, seven days after she examined the vaginal swab, Frausto-Heredia examined defendant's underwear. The underwear and the vaginal swab were never on the lab bench at the same time, and the disposable work surface was changed between each piece of evidence. The underwear tested negative for semen. Amber's panties also tested negative.

On June 22, Cortner examined defendant's shorts and found two foxtails on the outside and nine foxtails on the inside. Defendant's underwear contained eight foxtails on the outside, four in front and four in back.

Kinney found no fingerprints on the flashlight.

2004-2008 Lab Analysis

Many years later, in preparation for the second trial, Steven Myers, a senior criminalist at the Richmond DOJ lab, reexamined the evidence using Short Tandem

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15 Cortner testified as an expert in criminalistics and general forensic analysis.

Repeat (STR) DNA analysis.[16] Myers determined that defendant's DNA profile matched the DNA profile of the sperm on the vaginal swab. Defendant was included as a possible sperm donor.[17] The estimated frequency of the profile (shared by both defendant and the evidentiary sperm), or the chance that a randomly chosen person would have that profile, was approximately one in 3.9 quintillion African-Americans, one in 350 quadrillion Caucasians, and one in 4.2 quadrillion Hispanics.[18] In other words, the frequency of the profile was exceedingly rare.

Myers found that the DNA profile of the epithelial cells on the vaginal swab was consistent with Amber's profile. He also determined that the DNA profile of the blood smeared on Amber's body was consistent with her own profile.

Myers tested blood from Scott Nelson, collected on June 22, 1997, and from Scott's father, collected on March 21, 2007. Their profiles did not match the sperm on the vaginal swab and they were excluded as sperm donors. Their profiles also did not match the blood on Amber's leg.

Defense Evidence

Sandy Panico

Sandy testified that when she and defendant left the party, defendant seemed intoxicated. She had seen him that drunk before, but she had never seen him act the way he did that night.

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16 Myers testified as an expert in forensic DNA analysis and statistical DNA analysis.

17 Myers found it implausible that an analyst had contaminated the vaginal swab with semen. He had never seen transfer of that amount of sperm by contact.

18 One quadrillion is one followed by 15 zeros, and one quintillion is one followed by 18 zeros.

Kathleen Christine Conston

Chris testified that when Sandy came back to the house the second time at about 2:00 a.m. with only the baby, she was hysterical, upset, and scared. Sandy said she could not find Amber, she was gone, and she had screamed. Chris made her come into the house. Chris called the police and then they left in separate vehicles. Sandy drove the white truck and Chris took her vehicle.

Chris testified that defendant returned to her house just before 6:00 a.m. He had scratches that appeared to be from going through brush. He told Chris he had spoken to Amber and then he took off, and on his way home, a policeman accused him of kidnapping his sister. Defendant did not change his clothes because he had not brought any extra clothes. When he woke up, he had "the mother of all hangovers. In fact, he was still kind of drunk." Later, when he found out Amber had been killed, he cried. He was devastated because he and Amber were "extra close." The news "hit him pretty hard." Defendant stayed in North Fork after Amber's death and continued to work. He was a pall bearer at Amber's funeral. Two weeks later, he was arrested at work.

Chris thought Scott Nelson came to her house on June 11. He drove a white pickup truck.

William Davis

William Davis had lived in North Fork most of his life. In 1988, he saw defendant and Scott at a Halloween party. They were both dressed in deputies' uniforms. Scott was pulling a gun in and out of a holster.

William testified that he was familiar with trails that led from the area of the crime scene back into North Fork.

William agreed that he and defendant were "real good friends" and "[b]est buddies." They had known each other since grade school and they hung out together a lot, but William would not lie for defendant.

Betty Lyons

Betty Lyons was driving on Road 200 at about 2:00 a.m. on June 11. She came upon a tan Datsun pickup truck parked off to the side of the road. The truck's doors were closed and she did not see anyone inside. At a later time, Betty saw the same tan truck parked in front of Chris's house during the daytime.

Gena Fabris

Gena Fabris was driving on Road 200 sometime between midnight and 2:00 a.m. She noticed a small white pickup truck, like a Toyota, parked on the side of the road. She slowed to about 40 miles per hour as she passed it. The truck's lights were off and the doors were closed. She did not see anyone. When she drove by again five to 15 minutes later, the truck was still there. She still did not see anyone.

Guy Clements

Guy Clements was delivering newspapers that morning on Road 200. At about 3:00 a.m., he saw a small white pickup truck and a sheriff's vehicle near Sierra Automotive. The white truck had the body style of a 1970's Datsun. West of the crime scene, he saw a second pickup truck that looked like a 1984 Nissan.

William (Billy) Bain

Billy was with Gloria at Chris's house on June 10. He and defendant had a few beers during the day. They went to the party that night and drank some more. There was marijuana at the party, but Billy did not recall if defendant was smoking it. Scott was at the party and he was getting loud. He was a braggart who liked to drink. He always tried to arm-wrestle Billy every time they saw each other because Gloria was his old girlfriend. That was the reason Billy and Gloria left the party around 10:00 p.m. Billy remembered that Scott drove a small white Dodge truck. Billy never heard Scott confess to a crime.

Gloria Bain

Gloria testified that defendant had one beer at the school on June 10. At the party that night, there was drinking. It was a normal occurrence for this group of people to

smoke marijuana, but she could not recall if they did that night. Scott kept asking to arm-wrestle, which was his normal behavior. When Scott came to Chris's house the next day, he parked his white Dodge truck in the driveway. Defendant's truck was also in the driveway.

Sergeant Gauthier

Sergeant Gauthier did not see any blood on defendant's hands, body, or clothes. He did not swab defendant's hands or take fingernail scrapings. He took the samples required for a possible sexual assault.

Sherri Atkisson

Sherri Atkisson met Scott in June 1997. One day, they were talking with some other people. Scott consumed two beers. He seemed depressed and he said some alarming things. He said, "I killed her, not her brother, Mike." He said Mike did not do it. He did not mention the female's name. He said he was driving down the street and he passed her. She was in pajamas. He stopped, she ran into a field, and he chased her. He had to keep her quiet because she was going to reveal that they had been having sex. Another car was coming and he was trying to keep her quiet. Scott said she died, but he did not explain how. About a week after this conversation, Sherri heard that Scott had died.

When this conversation occurred, Sherri did not know defendant, Chris, or any of their family members. She had since met defendant's family in the courthouse hallways.

On cross-examination, Sherri explained that Scott had been to her home several times, but she did not know him very well. She agreed that she did not know if Scott had been drinking before he came to her house on that particular day. When Scott mentioned pajamas, he did not mention the clothes Amber was wearing when she died. Noel Bartley was present and able to hear everything Scott said. Sherri denied that the only thing Scott said was, "I should just choke you out, too," and she denied that she and her friends later concluded Scott must have been referring to Amber.

After Sherri heard Scott's statements, she contacted the Madera County District Attorney's office and reported that someone had admitted a murder to her. She requested a return call, but no one ever called her back. In 2007 and 2008, however, she refused to talk to state agents who asked to speak to her about Scott's alleged statement.

DISCUSSION

I. MISCONDUCT OF JUROR NO. 9

A. Introduction

This was an awful case on many levels: an abominable crime with complicated DNA evidence, two jury trials and a lengthy *Kelly* hearing in between. And if that did not present enough challenges, the second trial was fraught with allegations of jury misconduct committed by different jurors during the presentation of evidence and during jury deliberations. We need not discuss all of these allegations, because we find Juror No. 9's flagrant misconduct in reading this court's 2002 appellate opinion in this case sufficient to warrant reversal of the conviction.[19]

B. Juror No. 9's Misconduct

Juror No. 9 testified at the new trial motion hearing. He admitted that at the beginning of testimony in the trial, he went onto the Internet, researched the case and found a prior appellate opinion in this case. That opinion revealed: defendant had previously been convicted on all counts by another jury; he had been sentenced to life in prison without the possibility of parole; on the day of the killing he had consumed beer throughout the afternoon and continued to drink at a party; he testified at his first trial in which he contradicted portions of his statement to the police and admitted that "alcohol

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[19] Juror No. 9 also committed misconduct when he discussed this case with two neighbors during the trial. He also failed to divulge his prior criminal conviction during voir dire. The trial judge dismissed and replaced another juror for improperly discussing sentencing matters during deliberations. There were also allegations that "bullying" of jurors occurred in the jury room.

made him violent"; the FBI analysis presented at the first trial concluded that the DNA from the semen on the vaginal swabs matched the known blood sample of defendant; the case had been appealed twice; and the appellate court determined that the evidence against defendant was a "'strong circumstantial case'" and that the DNA evidence clearly """sealed [his] fate."""" (*Pizarro II*, *supra*, 110 Cal.App.4th at pp. 553, 634.)

In one part of his testimony at the hearing, Juror No. 9 said that he read the entire opinion a few times; in another part of his testimony, he said that he only skimmed portions of it; and in yet another part, he said he "soaked in" whatever he could understand of the opinion. Specifically, he explained that he conducted this Internet research two or three times. He "researched the case during the testimony phase of the trial. [H]e found the process of researching the case to be quite simple and detailed information of the case to be readily available through the Internet." As the testimony began, "[he] was lost. And that was really [his] reasoning to try and find to know where [he] was within the case." He "felt that [he] wanted to do what was right for [defendant's] case and understand what was going on within the case. So that was the reason why [he] had pulled up some information, which turned out to be the very thick PDF file [the prior appellate opinion], to understand how the series of events had happened." He "just wanted to understand the timeline[and] the series of events of the case so [he could] understand so [he could] be on top of stuff while [he was] listening …." He first read a current newspaper article about the case explaining it was an early DNA case for California courts and it was back in court. Then he turned to the prior appellate opinion, which "was so thick that it took [him] a long time." He did not pay much attention to the other items produced by his Internet search because the prior appellate opinion gave him the "information [he] needed to know what was going on." He downloaded the prior appellate opinion and kept it on his computer for about three weeks. He explained:

> "[I]nitially, … I just wanted to see it and when I seen that it had the—the timeline … [h]ow the timeline played out then that helped me out a lot. So I read all the way through from start to finish and that kind of gave me an overview to stay caught up with what you guys, in my opinion, what you guys were saying. I'm sure you guys were doing a good job, but I guess I'm slow. [¶] … [¶] No, [I did not read through the entire document;] when I got to the DNA stuff and markers and the alleles and all that it didn't … make sense at that time."

He said he would refer back to the prior appellate opinion when questions arose in his mind and he would attempt to clarify them. He mostly wanted to clarify the timeline. He said, "[I]t was mostly just facts that I was sticking to." When asked if he read the portion of the facts that explained defendant's testimony in the first trial, he answered, "Oh, okay, yeah. No, I read everything to where it started getting really technical, like the DNA, the extractions of DNA, and the markers. I didn't understand the theory and stuff like that. But, uh, yeah, I did read this." In reference to defendant's testimony, he explained:

> "I was looking at everything. I was looking at what people were saying, who said what. I was looking at who was where. I mean, that's timelines, that's what a timeline is. Where everybody was at. What they were saying. Who was involved. I mean, that's—that's what I was—and when it stop[ped] talking about stuff like that, and then it start[ed] going into theories and DNA markers and everything that I didn't understand, I stopped."

He said he just skimmed the DNA and "pulled out whatever [he] could understand, but most of it" did not make sense to him. He did, however, learn that the FBI was involved in analyzing the DNA evidence.

When asked again if he read the prior appellate opinion from beginning to end, he answered: "Oh, absolutely. I mean, what I could understand I soaked in."

The prior appellate opinion contained information that was not disclosed in the second trial. It was also highly prejudicial to defendant, as we explain in more detail later in this opinion. There can be little doubt that if, *during jury selection*, Juror No. 9 disclosed he had read the prior appellate opinion in this case, he would have been

immediately excused for cause. In our view, if this disclosure had been revealed to the court *during* the trial, and the defense thereafter moved the court to discharge him, the trial judge would likely have done so. Here, in contrast, the disclosure occurred *after* the verdict, where the controlling question was whether the juror was *actually* or *inherently* biased. (*Carpenter, supra*, 9 Cal.4th at p. 653.)

The parties agree that Juror No. 9 committed misconduct in consulting an extraneous information source and that prejudice is presumed unless rebutted. Defendant argues that the record establishes both actual and inherent bias on the part of Juror No. 9. The People dispute that actual bias against defendant was shown. As to inherent bias, they both cite cases in support of their respective positions that the presumption of prejudice was or was not rebutted.

Actual bias does not require a showing of prejudice before a verdict will be set aside, because a defendant is entitled to 12 unbiased jurors, not 11, regardless of whether an unbiased jury would have reached the same verdict. (*Carpenter, supra,* 9 Cal.4th at p. 654.) On the other hand, a finding of *inherently likely bias* carries a presumption of prejudice that may be rebutted by an affirmative evidentiary showing or by a reviewing court's examination of the entire record. (*Id.* at p. 657.) The presumption is imposed because Evidence Code section 1150 precludes a defendant from affirmatively proving that the jury's deliberations were improperly affected by the misconduct. Since actual prejudice cannot be proven, bias is established if the extraneous material, judged objectively, is inherently and substantially likely to have influenced the juror. (*Carpenter, supra,* at pp. 652-653.) We conclude that is what happened here.

C. Standard of Review

Whether prejudice arose from jury misconduct is a mixed question of law and fact subject to an appellate court's independent determination. (*People v. Nesler* (1997) 16 Cal.4th 561, 582-583 (*Nesler*) [reviewing court independently determines whether juror was biased].) Courts have stressed the particular need for independent review of the trial

court's reasons for denying a new trial motion in juror bias cases. This is because the reviewing court must protect the complaining party's right to a fully impartial jury as an "'"'"inseparable and inalienable part" of the [fundamental] right to jury trial [(U.S. Const., amend. VI; Cal. Const., art. I, § 16)]. [Citations.]'" (*People v. Ault* (2004) 33 Cal.4th 1250, 1262.)

D. The Seminal Case of Carpenter

In *Carpenter*, the defendant was found guilty of rape and murder, and was sentenced to death. The trial court granted the defendant's habeas corpus petition based on juror misconduct in obtaining extraneous information about the defendant's convictions and death sentences in a related case. While the trial court stated that the evidence of guilt was "'overwhelming,'" it concluded that the usual harmless error test did not apply. (*Carpenter, supra,* 9 Cal.4th at pp. 644-645.) The Supreme Court reversed without prejudice to the defendant's right to file a new petition based on the combined records of the habeas corpus proceeding and the underlying trial. (*Id.* at p. 660.) In a four-to-three opinion, a divided Supreme Court set forth a two-part test for determining bias in an extraneous source case.

First, *inherent bias* is shown if the extraneous material, judged objectively, is *inherently and substantially likely* to have influenced the juror—in other words, had an '"'"effect on the verdict or … deprived the complaining party of thorough consideration of his case …."'" (*Carpenter, supra,* 9 Cal.4th at p. 652, quoting from *Hasson v. Ford Motor Co.* (1982) 32 Cal.3d 388, 416 (*Hasson*)), or the vote of the juror was influenced by exposure to prejudicial matter relating to the defendant (*Carpenter, supra,* at p. 651, quoting from *People v. Marshall* (1990) 50 Cal.3d 907, 950-951 (*Marshall*)). This test is "analogous to the general standard for harmless-error analysis under California law." (*Carpenter, supra,* at p. 653.) Under that standard, trial court error is deemed harmless unless there is a reasonable probability that it affected the verdict. (*People v. Watson* (1956) 46 Cal.2d 818, 836 (*Watson*).)

Second, if the misconduct and surrounding circumstances make it substantially likely that the juror was *actually biased* against the defendant, the judgment must be set aside no matter how convinced the court might be that an unbiased jury would have reached the same result. (*Carpenter, supra*, 9 Cal.4th at p. 654.)

Respectfully, we find the *Carpenter* majority opinion confusing and in some respects contradictory of the very case authority it relies on in reaching its conclusion that harmless error analysis applies to a case of inherent juror bias. In applying the harmless error analysis, *Carpenter* announces a rule that arguably undermines the integrity of our jury system. (*Nesler, supra,* 16 Cal.4th at p. 578 [requirement that verdict must be based on evidence developed at trial goes to fundamental integrity of trial by jury].) We are not the first court to question the reasoning, language and conclusion of the *Carpenter* opinion. (See *People v. Von Villas* (1995) 36 Cal.App.4th 1425, 1445-1458 (Woods, J., dis. opn.).) We will explain.

After summarizing and approving prior case law concerning juror exposure to extraneous information—including *Marshall, supra,* 50 Cal.3d at pages 950 through 951 and *People v. Holloway* (1990) 50 Cal.3d 1098 (*Holloway*), disapproved on another point in *People v. Stansbury* (1995) 9 Cal.4th 824, 830, fn. 1—for the propositions that (1) harmless error analysis for ordinary trial error does *not* apply to inherent juror bias based on a juror's exposure to extraneous material, (2) consideration of actual prejudice is *not* warranted in such circumstances, and (3) the ultimate question of whether a juror's exposure to extraneous material constitutes reversible juror misconduct is judged by an objective standard, namely, whether, based on an examination of the extraneous material, the court concludes the material is inherently and substantially likely to have influenced the juror (*Carpenter, supra,* 9 Cal.4th at p. 651, citing and quoting from *Marshall*), the *Carpenter* majority then inexplicably concludes its analysis by stating—directly contrary to *Marshall* and *Holloway*—that inherent juror bias based on extraneous material is governed by the general standard for harmless error analysis. (*Carpenter, supra,* at

p. 653.) Not only does the majority opinion not disapprove *Marshall* and *Holloway*, it cites both cases approvingly for the rule that standard harmless error analysis does *not* apply in an inherent bias case. Then, in an apparent turnaround, the *Carpenter* majority declares, citing *Hasson*, that the presumption of prejudice can be rebutted where there is overwhelming proof in support of the verdict. (*Carpenter, supra,* at p. 654, citing *Hasson, supra,* 32 Cal.3d at p. 417.) In other words, under harmless error analysis, the misconduct can always be deemed harmless if the evidence of guilt is strong enough.

We find this proposition deeply troubling on many levels: it fails to uphold the venerable and constitutional right to an *impartial* jury; it fails to recognize the difference between assessing prejudice from ordinary trial error and from jury misconduct that impugns the guarantee of an impartial jury; it conflicts with several Supreme Court cases that did not apply harmless error analysis in an inherent bias case; it validates trial outcomes even when a juror has flagrantly disregarded the rules of evidence and procedure that the parties and trial judge have endeavored scrupulously to follow throughout a trial; it significantly impairs the presumption of prejudice, which the law imposes for this kind of jury misconduct; it holds that the only adverse "influence" on a juror that matters is one that changes a juror's vote; it unduly expands the role of the reviewing court in derogation of the jury's role; and it treats inherent juror bias the same as the erroneous introduction of evidence in determining whether the judgment should be reversed. We discuss each of these points in turn.

E. Effects of Carpenter

1. Right to Impartial Jury

The United States and California Constitutions guarantee the right to an impartial jury. (U.S. Const., 6th Amend. ["the accused shall enjoy the right to a speedy and public trial, by an impartial jury"; Cal. Const., art. I, § 16 ["Trial by jury is an inviolate right"]; *People v. Wheeler* (1978) 22 Cal.3d 258, 265 [art. I, § 16 includes the right to have verdict rendered by *impartial* jurors], overruled in part by *Johnson v. California* (2005)

545 U.S. 162, 165-173.) The integrity of any trial depends upon the impartiality of the judge and jury. A major objective of the jury selection process and the trial court's repeated admonition that jurors not discuss the case with others and not consider matters outside the evidence received in the courtroom is to select jurors who are and will remain impartial. Any deficiency that undermines a trial's integrity calls for reversal *without consideration of actual prejudice*. (*Carpenter, supra,* 9 Cal.4th at p. 651, quoting from *Marshall, supra,* 50 Cal.3d at p. 951.)

2. Harmless Error Analysis

Harmless error analysis presupposes an impartial judge and jury. (*Rose v. Clark* (1986) 478 U.S. 570, 576-579.) Our California Constitution specifies that no judgment may be set aside based on errors of misdirection of the jury, improper admission or rejection of evidence, errors of pleading, or errors of procedure unless the error results in a miscarriage of justice. (Cal. Const., art. VI, § 13.) Whether a miscarriage of justice occurs depends on whether the error affected the outcome of the case. (*People v. Breverman* (1998) 19 Cal.4th 142, 165.) When one of these enumerated trial errors is established, the harmless error test permits a reviewing court to consider the weight and strength of the evidence to determine if the lower court error was prejudicial, that is, whether the error affected the outcome. (*Watson, supra,* 46 Cal.2d at p. 836.) Juror misconduct is not one of the trial errors enumerated in article VI, section 13.

Some lower court errors defy harmless error analysis, such as when a defendant is deprived of his right to counsel or where the trial judge is not impartial. (*Arizona v. Fulminante* (1991) 499 U.S. 279, 309-310.) The reason is this: "Each of these constitutional deprivations is a similar structural defect affecting the framework within which the trial proceeds, rather than simply an error in the trial process itself. 'Without these basic protections, a criminal trial cannot reliably serve its function as a vehicle for determination of guilt or innocence, and no criminal punishment may be regarded as fundamentally fair.' (*Rose v. Clark*, [*supra*], 478 U.S., at 577-578 (citation omitted)."

(*Id*. at p. 310.) Likewise, an inherently biased juror who has received extraneous information prejudicial to the defense commits more than a simple error in the trial process. The misconduct infects the legitimacy of the entire trial framework.

We believe the *Marshall* and *Holloway* decisions got it right in declaring that when it is inherently likely that extraneous information influenced a juror, an appellate court's opinion of the strength of the evidence of guilt should not and may not be used to uphold the verdict.[20] If the extraneous information is sufficient to lead a reviewing court to conclude the information is substantially likely to have influenced the juror, that should end the inquiry. Inherent juror bias is still bias. The strength of the evidence can never erase a verdict's taint of juror bias, whether actual or inherent.

Our case is analogous to cases where the jury has been misinstructed on the burden of proof. When a jury is instructed on a lower standard of proof than proof beyond a reasonable doubt, the harmless error test does not apply:

> "[I]f a reviewing court were to rely on its view of the overwhelming weight of the prosecution's evidence to declare there was no reasonable possibility that the jury based its verdict on a standard of proof less than beyond a reasonable doubt, the court would be in the position of expressing its own idea 'of what a reasonable jury would have done. And when [a court] does that, "the wrong entity judge[s] the defendant guilty." [Citations.]'" (*People v. Aranda* (2012) 55 Cal.4th 342, 368 (*Aranda*), quoting from *Sullivan v. Louisiana* (1993) 508 U.S. 275, 281 (*Sullivan*).)

Here, it is likely that Juror No. 9's receipt of the extraneous information contained in the prior appellate opinion prejudiced the defense, as we discuss below. It can never be proven whether Juror No. 9's exposure to the prior appellate opinion actually affected

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20 This is also in line with the American Bar Association standards (*Marshall, supra*, 50 Cal.3d at pp. 950-951) and consistent with two earlier Supreme Court opinions that reversed convictions due to juror receipt of extraneous information, without giving any consideration to the strength of the evidence of guilt (*People v. Honeycutt* (1977) 20 Cal.3d 150, 157-158; *People v. Pierce* (1979) 24 Cal.3d 199, 206-207 [*Watson* harmless error test not appropriate]).

his vote on the verdict. (Evid. Code, § 1150 [effect of a statement or conduct on juror's mental processes or voting is inadmissible].) But viewing the prior appellate opinion objectively, we conclude there is a substantial likelihood that the material influenced Juror No. 9 in a way that favored the prosecution and disfavored the defense. For example, the extraneous information may have, in Juror No. 9's mind, lowered the prosecution's burden, shifted the burden of proof to the defense, or made him skeptical of defense theories or evidence. (*People v. Martinez* (1978) 82 Cal.App.3d 1, 21-22; *People v. Cumpian* (1991) 1 Cal.App.4th 307, 312 [prosecutor's burden lightened or defense contradicted].) This is so even though Juror No. 9 may still have voted for guilt had he not received the extraneous information (as speculative as that is).

The People, relying on *Carpenter*, contend that regardless of the quantity or prejudicial content of the extraneous information, and as long as it does not amount to *actual bias*, inherent juror bias should be deemed harmless if the appellate court determines the evidence of guilt is sufficiently compelling. But a defendant's right to an impartial jury is trivialized if a reviewing court can excuse serious jury misconduct by declaring that any reasonable juror who had not been exposed to the extraneous information would have found the defendant guilty anyway.

3. Conflicts with Precedent

In 1990, just five years before *Carpenter* was handed down, the California Supreme Court decided *Marshall* and *Holloway*. Both opinions made the emphatic point that assessing prejudice resulting from a juror's exposure to extraneous information is "different from" and "less tolerant than" harmless error analysis for ordinary trial error. (*Marshall, supra,* 50 Cal.3d at p. 951; *Holloway, supra,* 50 Cal.3d at p. 1110.) *Marshall*'s opinion was unanimous and *Holloway* included a single, concurring opinion and no dissent. *Carpenter* cites both cases approvingly and even quotes the above language in its own opinion. (*Carpenter, supra,* 9 Cal.4th at p. 651.)

Marshall did not announce a new rule. Earlier Supreme Court decisions reversed convictions based on a juror's obtaining extraneous information without any discussion of the strength of the evidence or the harmless error rule. (See *People v. Von Villas, supra,* 36 Cal.App.4th at pp. 1446-1447 (Woods, J., dis. opn.).) And, lest there be a concern that the presumption of prejudice is too difficult to overcome in the absence of the harmless error rule, we point out that our Supreme Court has affirmed several cases since *Carpenter, supra,* 9 Cal.4th 634 by finding that the information was not prejudicial to the defendant for reasons unrelated to the strength of the evidence of guilt. (*People v. Thomas* (2012) 53 Cal.4th 771, 819 [juror learning of witness's wife's recent shooting death not likely prejudicial because witness's testimony only involved defendant's purchase of a truck, which was not actively contested]; *People v. Tafoya* (2007) 42 Cal.4th 147, 195 [no likelihood of detrimental influence because the misconduct occurred after the verdict]; *People v. Yeoman* (2003) 31 Cal.4th 93, 159-160 [juror's improper remarks about drug screening procedures at jail not objectively prejudicial because whether the defendant was under the influence had little relevance to his mental state and whether he ever used drugs was not at issue]; *People v. Jenkins* (2000) 22 Cal.4th 900, 1048 [prejudice rebutted where juror who received information about case from news source was questioned during trial and trial judge made findings that juror learned very little, asserted he could be fair, was conscientious juror, and was relieved to learn that news account was false].)

The *Marshall* test for evaluating prejudice in an inherent bias case is reasonable. If the reviewing court, after a careful review of the record, determines it is inherently and substantially likely that the extraneous material influenced the juror to the defendant's detriment, the judgment must be set aside. Prejudice in this context does not require proof of "actual prejudice," that is, proof that the extraneous material changed a juror's vote. Thus, this prejudicial analysis is different from and less tolerant than harmless error analysis. (*Marshall, supra,* 50 Cal.3d at p. 951; *Holloway, supra,* 50 Cal.3d at p. 1110;

Carpenter, *supra*, 9 Cal.4th at p. 651.) We would clarify the test by making explicit that influencing a juror to the defendant's detriment means likely to cause a juror to lower the prosecutor's burden, shift the burden to the defense, become skeptical of defense evidence or theories, deprive the defendant of thorough consideration of his case, or vote differently than the juror would have if not exposed to the extraneous information.

4. Disregard of Rules of Evidence and Procedure

The *Carpenter* rule can lead to affirming verdicts in cases where the rules of evidence and procedure, which trial judges and counsel endeavor scrupulously to follow, are flagrantly disregarded by a juror or jurors. (*Holloway*, *supra*, 50 Cal.3d at p. 1110 [court's and counsel's "efforts were to no avail"].)

A jury trial is not a free-for-all presentation of evidence and argument. Guided by the rules of evidence, along with considerations of procedural and substantive law, a trial judge makes numerous rulings that regulate the admissibility of evidence. These rulings directly influence the parties' trial strategies, including what witnesses to call, what questions to ask and how to argue their cases before the jury. Counsel are bound by the trial court's rulings and are often expressly prohibited from bringing certain matters before the jury by way of evidence or argument. When jurors receive information about the case outside of the courtroom, all of the work of the court and parties to comply with the law is potentially undone. When the extraneous information is viewed objectively and the court determines the information is likely to have biased the juror against the defendant, it is not reasonable, in light of the trial court's efforts to limit the evidence to what is permitted by law, to uphold the verdict simply because a reviewing court thinks the defendant would have been convicted anyway.

By way of illustration, assume a defendant is charged with robbery and there is overwhelming evidence of his guilt. Assume six jurors independently learn from reading the newspaper the following additional information that was expressly ruled inadmissible before the trial began: the defendant had four prior robbery convictions, had been to

prison, was on parole when the instant offense occurred, confessed to the crime (a *Miranda* violation made it inadmissible), and had two other pending robbery cases. The six jurors do not share this information with any other jurors. No actual bias is shown. Can this serious misconduct be regarded as harmless and the verdict upheld simply because the reviewing court concludes that the defendant, in the absence of the jury misconduct, would have been convicted anyway? According to *Carpenter*, the answer is yes.

5. Presumption of Prejudice

Carpenter renders the presumption of prejudice useless when the evidence of guilt is "'overwhelming.'" (*Carpenter, supra*, 9 Cal.4th at p. 655.) A verdict should not stand if an objective view of the extraneous information leads to the conclusion that the extraneous information was substantially likely to have influenced the juror. (*Marshall, supra,* 50 Cal.3d at pp. 650-651.) Extraneous material can influence a juror in different ways: lowering the prosecutor's burden, shifting the burden to the defense, making the juror skeptical of defense evidence or theories, depriving the complaining party of thorough consideration of his case, or actually causing the juror to vote differently than the juror would have if he or she had not received the outside material. Since a defendant cannot elicit from a juror how the information affected the juror's thinking (Evid. Code, § 1150), the law imposes a presumption of prejudice to compensate for this evidentiary handicap. (*Carpenter, supra,* 9 Cal.4th at p. 652.) But allowing the weight of the evidence—as judged by a reviewing court—to overcome the presumption renders the presumption illusory. It is circular reasoning to impose the presumption because of a defendant's legal inability to prove actual prejudice, and then allow the prosecution to overcome the presumption by convincing the court that the defendant would have been convicted in the absence of the misconduct, when it is clear that the defendant cannot offer any rebuttal because he is precluded from asking jurors about the effect the outside material had on their thought processes.

In other words, if the evidence is strong enough, there really is no presumption of prejudice, which means the only way a defendant will be entitled to a new trial based on jury misconduct in receiving extraneous information is to prove actual prejudice, which Evidence Code section 1150 precludes him from proving.

6. Influencing a Juror

Although *Carpenter* does not say so expressly, one effect of applying the harmless error analysis in these circumstances is to declare categorically that the only influence on a juror that is relevant is whether the extraneous material actually affected the juror's *vote*. *Carpenter* ignores other inimical influences that may occur, such as lowering the prosecutor's burden, shifting the burden to the defense, or making the juror skeptical or distrustful of defense evidence or theories. It also ignores language in its own opinion that the presumption of prejudice is an "'"aid to those parties who are able to establish serious misconduct of a type likely to have had an effect on the verdict *or which deprived the complaining party of thorough consideration of his case* …."'" (*Carpenter, supra,* 9 Cal.4th at p. 652, quoting from *Hasson, supra,* 32 Cal.3d at p. 416, italics added.) No one could reasonably argue that such influences are innocuous or do not matter. They can affect a juror's ability to cast his or her vote based solely on the evidence received in court and affect a juror's ability to hold the prosecution to the burden of proving guilt beyond a reasonable doubt.

Thus, prejudice can be shown not only when the misconduct results in a different verdict, but also when the misconduct deprives the defendant of thorough consideration of his case. If an objective appraisal of the extraneous information leads a reviewing court to conclude that it is likely such information would lower the prosecution's burden, shift the burden to the defense, or create skepticism about the defense in the mind of a juror receiving such information, then the defendant has been prejudiced because he has been deprived of thorough consideration of his case by an unbiased jury.

We know that if a trial court errs in instructing on the prosecution's burden of proof, the error is reversible per se; harmless error analysis does *not* apply. (*Aranda, supra,* 55 Cal.4th at p. 367; *Sullivan, supra,* 508 U.S. at p. 281.) We fail to discern a difference between a case where the trial court has misinstructed on the prosecution's burden of proof and a case of jury misconduct based on receipt of extraneous information that influenced the juror by lowering the prosecutor's burden of proof or shifting it to the defense. If the reviewing court believes the material was substantially likely to have influenced the juror in one of these ways, there should be no further opportunity to rescue the verdict under the harmless error test. This is particularly so when the misconduct is discovered *after* the verdict because there is no opportunity for the court to take corrective steps through admonition or other measures. (*Holloway, supra,* 50 Cal.3d at pp. 1111-1112.) The inherent bias test, as described in *Marshall* and *Holloway,* is reasonable, understandable and sufficient to identify reversible prejudice. The harmless error test should not be tacked on to it.

7. Expanding Reviewing Court's Role

Another concern is that *Carpenter* expands an appellate court's traditional limited role to one that includes weighing evidence to determine whether a jury would have convicted defendant absent the misconduct. While appellate courts are called upon to consider the weight of the evidence in applying harmless error analysis to ordinary trial error scenarios (*Watson, supra,* 46 Cal.2d 818) and to cases in which federal constitutional error has occurred (*Chapman v. California* (1967) 386 U.S. 18), such is not the case where the error is "structural" (*Arizona v. Fulminante, supra,* 499 U.S. at p. 309) or undermines the integrity of a trial (*Marshall, supra,* 50 Cal.3d at p. 951). A conviction marred by juror bias—actual or inherent—undermines the integrity of a trial. When a reviewing court nonetheless affirms a conviction by applying the harmless error test, then """the wrong entity judge[s] the defendant guilty""" (*Aranda, supra,* 55 Cal.4th at p. 368,

quoting from *Sullivan, supra,* 508 U.S. at p. 281), and it oversteps its role as a reviewing court and treads on the exclusive domain of the jury.

8. Treating Inherent Juror Bias the Same as Erroneous Introduction of Evidence at Trial

Carpenter declares that "a finding of 'inherently' likely bias is required when, but only when, the extraneous information was so prejudicial in context that its erroneous introduction in the trial itself would have warranted reversal of the judgment." (*Carpenter, supra,* 9 Cal.4th at p. 653.) However, these two situations (inherent juror bias and erroneous introduction of evidence) should not be treated the same.

It is a common, everyday trial experience to have prejudicial evidence (or argument) introduced in open court after which the trial judge is asked to strike the matter and instruct the jury to disregard it. There is a standard jury instruction that reminds jurors not to consider matters that the court previously told them to disregard. (CALCRIM No. 104; CACI No. 106.) In most situations, any prejudicial effect is eliminated or at least mitigated by the court's instruction, since jurors are presumed to follow the court's instructions. (*People v. Boyette* (2002) 29 Cal.4th 381, 436.) Even if no corrective instruction is given, the attorneys have the opportunity to respond to such evidence with cross-examination, rebuttal witnesses and closing argument. Not so with inherent juror bias that is discovered *after* the verdict.

Another difference is that jury misconduct based on receipt of extraneous material carries with it a presumption of prejudice, while the erroneous introduction of evidence in the trial itself does not.

Finally, and most importantly, if inherent juror bias exists, then the parties have lost their constitutional right to have their case decided by an impartial jury. On the other hand, the introduction of erroneous evidence normally does not jeopardize a fundamental, constitutional right.

F. Confusing References in Carpenter

The *Carpenter* majority confusingly cites *Marshall* for the proposition that in an actual bias case, harmless error analysis does not apply. (*Carpenter, supra,* 9 Cal.4th at p. 654, citing and quoting from *Marshall, supra,* 50 Cal.3d at p. 951.) We agree that the harmless error test does not apply in an actual bias case, but *Marshall* was not an actual bias case and never addressed the subject of actual bias. It dealt with *inherent* juror bias. Thus, the portion of the *Marshall* opinion that *Carpenter* cites in support of its declaration that harmless error analysis does not apply to actual juror bias was actually a statement the *Marshall* court made regarding inherent juror bias.

The *Carpenter* majority cites *Hasson* as an example of the application of the harmless error analysis in an extraneous information case (*Carpenter, supra,* 9 Cal.4th at p. 654). But the portion of the *Hasson* opinion cited by *Carpenter* dealt with misconduct based on juror *inattentiveness*, not on a juror's receipt of extraneous information. (*Hasson, supra*, 32 Cal.3d at p. 414.) The *Carpenter* majority's characterization of *Hasson* as an example of a case in which the harmless error standard was applied in an extraneous information case is simply incorrect.

G. Reconsideration of Carpenter

We respectfully urge our Supreme Court to reconsider its *Carpenter* opinion and to follow the *Marshall-Holloway* line of authority that excludes application of the harmless error analysis in an inherent juror bias case based on receipt of extraneous information. We believe that harmless error analysis should not apply to cases of juror bias, whether actual bias or inherent bias. The test of whether a juror was influenced by the extraneous information should not be limited to the situation where it caused the juror to cast a different vote than the juror would have cast if the extraneous material had not been considered. It should be sufficient to show juror bias if the extraneous material is substantially likely to have caused the juror to lower the prosecutor's burden, shift the

burden to the defense, become skeptical of defense evidence or theories, or deprive the defendant of thorough consideration of his case.

H. Analysis of the Present Case

1. No Actual Bias

Here, the trial judge determined that there was no actual bias on the part of Juror No. 9. We agree that the record does not support any finding of actual bias. Although his misconduct was flagrant, Juror No. 9 did not discuss what he did or what he learned with the other jurors and there is no indication that he prejudged the case. (*Carpenter, supra*, 9 Cal.4th at p. 657 ["a biased juror would likely have told other jurors what she had learned"].) The trial court did not abuse its discretion when it ruled that Juror No. 9 had no actual bias.

2. Inherent Bias and Prejudice

The trial judge found, and both sides agree, that Juror No. 9's misconduct constituted inherent bias, which creates a presumption of prejudice that is rebuttable by the People or by the court's review of the entire record. We have considered the People's arguments and authorities and we have reviewed the record. In our view, the presumption of prejudice has not been overcome. We reach this conclusion under both the *Marshall-Holloway* test (objective standard applies to determine whether extraneous material is inherently and substantially likely to have influenced the juror without consideration of harmless error analysis or actual prejudice) and the *Carpenter* test (harmless error test does apply). We conclude that the extraneous information was so prejudicial in context that its erroneous introduction in the trial itself would have warranted reversal of the judgment. (*Carpenter, supra*, 9 Cal.4th at p. 653.)

The People, however, assert that the presumption of prejudice has been overcome "since most of the additional information [J]uror [No.] 9 learned from this Court's prior appellate opinion—'a time line of the case, facts … and details about DNA'—was

presented to the jury anyway" and because the evidence was "truly overwhelming." We address and reject both contentions.

3. The People's Contentions Lack Merit

a. The Extraneous Information Was Not Introduced in the Second Trial

First, the People contend that the juror misconduct does not require reversal because most of the extraneous information "was presented to the jury anyway." In order to assess this assertion we will now juxtapose the contents of the prior appellate opinion with the evidence received in the second trial to determine whether inherent prejudice should be presumed or whether the People are correct that most of the extraneous information "was presented to the jury anyway."[21]

The second jury was not directly informed that there had been a first trial, that defendant had previously been convicted of the crimes for which he was then on trial, or that he had been sentenced to life in prison.[22] The prior appellate opinion begins by stating that defendant was previously convicted of murder, forcible lewd or lascivious conduct on a child under age 14, and forcible rape. This information was potentially prejudicial to the defense because Juror No. 9 became aware that 12 other jurors had concluded unanimously and beyond a reasonable doubt that defendant committed these crimes. Moreover, the court and parties endeavored not to mention these matters to the second jury. This has some similarity to *Holloway*, where the court reversed a conviction based on a juror's misconduct in reading a newspaper account that revealed the defendant

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[21] The trial judge commented, "And certainly, you know, [Juror No. 9 was] privy to a lot of information that he should not have been privy to."

[22] For the most part, the attorneys and witnesses avoided mentioning that there had been an earlier trial. Instead, when necessary to refer to testimony given in the first trial, they characterized the first trial as a "previous proceeding," "prior proceeding," "earlier proceedings," and the like, although one witness referred to "the original trial" and the "first trial."

was on parole for another assault when he was arrested for the charged crimes. The court explained:

> "The entire case was tried on the premise that defendant's prior record was inadmissible. There was no voir dire about it, no limiting instructions were given, and the parties went to great effort to excise such references from defendant's extrajudicial statements. The court had no chance to take any curative measures because of Juror Beck's concealment of the misconduct. In such circumstances, we are unable to say that the juror misconduct did not prejudicially affect the outcome of the trial." (*Holloway, supra,* 50 Cal.3d at p. 1112.)

However, Juror No. 9's knowledge of defendant's convictions, standing alone, may not have been sufficiently prejudicial to warrant reversal. (*People v. Ledesma* (2006) 39 Cal.4th 641, 683 (*Ledesma*) [nothing incurably prejudicial about a jury learning that a defendant was previously convicted of the crime for which he was then on trial]; *Carpenter, supra,* 9 Cal.4th at p. 655 [evidence that the defendant had been convicted of different but related crimes not prejudicial where evidence was overwhelming and the only fact the juror learned out of court was the verdict of the first jury].) But there is more.

The prior appellate opinion quotes from the statement of facts contained in the earlier opinion (*Pizarro I, supra,* 10 Cal.App.4th 57). The statement of facts from *Pizarro I* mentions that defendant testified in the first trial. He did not testify in the second trial, and the second jury was never informed that there had been an earlier trial or that defendant had testified in a previous trial. Surely, the defense did not want the second jury to know that defendant had previously been convicted or that he had testified in the first trial. While the jury was properly instructed that defendant had a constitutional right not to testify and that the jury was not to discuss this subject or penalize defendant for exercising that right, it is reasonable to project that, armed with the knowledge that defendant had been convicted in an earlier trial in which he testified, a juror would be inclined to think defendant chose not to testify in his second trial because

the defense believed that his testimony in the first trial contributed to his earlier conviction. If this occurred in the mind of Juror No. 9, it certainly prejudiced defendant, but Evidence Code section 1150 precludes inquiry into Juror No. 9's mental processes. Prejudice is presumed from the misconduct. Again, by itself, the disclosure that defendant testified in the first trial may not be enough to establish prejudice warranting reversal. (*Ledesma, supra*, 39 Cal.4th at p. 683.) But there is more.

On the subject of defendant's sobriety on the day of the crime, the prior appellate opinion states defendant had consumed beer throughout the afternoon and continued to drink at the party. When Sandy asked him to get into their truck, he behaved erratically, crisscrossing the road, lying in front of the truck and hiding from her. Later, he showed up at his mother's house and, according to his mother, appeared to be drunk. The People counter by citing testimony received in the second trial in which some witnesses said defendant did not appear intoxicated or he seemed to be handling his alcohol "okay." The People miss the point. The question here is whether Juror No. 9 was substantially likely to have been prejudiced against defendant on the subject of his sobriety based on the prior appellate opinion's statement of the facts. That statement of facts leaves no doubt that the appellate court's review of the trial record led it to conclude that defendant was drunk. If the second trial evidence was in conflict on the issue, Juror No. 9 had the impression that a panel of appellate justices had concluded he was drunk. Thus, the People's claim that the extraneous information was presented to the jury anyway is not accurate. The jury was not told that an appellate court's review of the evidence led it to conclude that defendant was drunk. This information, judged objectively, was inherently and substantially likely to have influenced Juror No. 9 unless intoxication had nothing to do with the crimes, which leads us to the next related issue: motive.

The prior appellate opinion reveals that defendant told an investigator that alcohol made him violent. This testimony was never mentioned in the second trial. Not only does this admission make relevant how much alcohol defendant had consumed at the

time of the crime, it also furnishes an explanation for why this homicide even occurred. Defendant points out that the People offered no explanation for why he would harm his younger half-sister except for his intoxication and desire for sexual gratification, and that there was no evidence of any prior improper behaviors between them and no evidence that defendant had ever been violent. Therefore, defendant's admission that alcohol made him violent, coupled with the appellate court's conclusion that he was drunk at the time, supplies the necessary motivation or explanation for why defendant would commit such an abominable crime against his 13-year-old half-sister.

The People point out that the defense attempted to use alcohol as a defense to minimize defendant's mental state. If so, defendant's admission in the first trial that alcohol made him violent becomes particularly prejudicial because the more the defense emphasized his intoxication as a mitigating factor, the more inculpatory his admission became. In other words, the admission that alcohol made him violent ran directly contrary to the defense position that his intoxication mitigated his culpability. Instead of minimizing his culpability, the admission explained his culpability. The prior appellate opinion's inclusion of this admission was potentially devastating to the defense in the mind of any juror who read it. Judged objectively, this admission was inherently and substantially likely to have influenced Juror No. 9. (*Carpenter, supra*, 9 Cal.4th at p. 653.) There is more.

Most of the prior appellate opinion is devoted to a discussion of the DNA evidence in very technical and scientific terms. Aside from the complexities of that discussion, the opinion makes clear that the FBI conducted its own analysis of the DNA and concluded that the DNA from the sperm on the vaginal swabs matched the known blood sample of defendant. This court's opinion reversed the conviction because of flaws in the DNA testing procedures. The second trial made no mention of the FBI's DNA analysis or its conclusions. A reading of the prior appellate opinion's introduction or statement of the facts would inform the reader that the FBI's DNA analysis led it to conclude that

defendant was Amber's assailant and killer. This was the same conclusion reached by the California DOJ, which years later conducted its own DNA analysis that was presented in the second trial. The prior appellate opinion's disclosure of the FBI's analysis and conclusion corroborated the conclusion of the DOJ and thereby created a substantial likelihood of juror bias. It likely lightened the prosecution's burden on convincing Juror No. 9 of the soundness of the DOJ's conclusions because a separate and nationally recognized crime lab analyzed the DNA and came to the same conclusion. This is analogous to an appellate court's reversing a conviction because an eyewitness's testimony should have been excluded and then having a juror in the second trial learn, through an extraneous and improper source, that there was an eyewitness who saw defendant commit the crime, but for technical legal reasons was not allowed to testify at the second trial. Judged objectively, the FBI's conclusion was inherently and substantially likely to have influenced Juror No. 9. (*Carpenter, supra*, 9 Cal.4th at p. 653.) There is still more.

The prior appellate opinion also declares that the evidence presented a "'strong circumstantial case'" against defendant. (*Pizarro II*, *supra*, 110 Cal.App.4th at p. 634.) Thus, Juror No. 9 sat through the balance of the trial with the knowledge that an appellate court believed the case against defendant was a strong one. Imagine if, on the second or third day of trial, a juror overheard a trial judge comment to someone off the record that the case against the defendant was a "'strong circumstantial case'" (*ibid.*); or, even worse, if the trial judge made such a comment on the record in open court in front of the jury. Would not the defense have legitimate grounds to object and move for mistrial because of the understandable concern that the judge's comments would tend to influence the jury and thereby prejudice the defense? Would not such a comment, judged objectively, create a substantial likelihood that the jury would give some deference to the judge's implied opinion that the defendant was guilty or at least that the prosecution had met their burden of proof? Here, instead of the trial judge making such a comment, we have a

three-judge appellate panel doing so in a formal appellate opinion. Judged objectively, this statement was inherently and substantially likely to have influenced Juror No. 9. (*Carpenter, supra,* 9 Cal.4th at p. 653.)

These enumerated items of information, which were disclosed in the prior appellate opinion read by Juror No. 9, were not presented "to the [second] jury anyway," as asserted by the People. Indeed, the trial court and counsel made special efforts to ensure that several of these matters were never revealed to the second jury. Juror No. 9's misconduct spoiled those efforts.

b. The Evidence of Guilt Was Not "Overwhelming"

Second, the People contend that the evidence of defendant's guilt was "truly overwhelming" and therefore any juror misconduct was harmless. They cite *Carpenter* for the proposition that where the evidence is "'overwhelming,'" the extraneous information cannot be considered inherently prejudicial. (*Carpenter, supra,* 9 Cal.4th at p. 655.)[23] In *Carpenter,* the trial judge specifically found the evidence of guilt "'overwhelming,'" but erroneously concluded that the extraneous information was inherently prejudicial without considering the entire record. (*Ibid*.) The judge also stated that the usual harmless error tests did not apply. (*Id.* at p. 644.) By contrast, in the instant case, the trial judge did not state the evidence of guilt was overwhelming. The *Carpenter* case was cited by the parties and mentioned numerous times during oral argument on the new trial motion and yet the trial judge never characterized the evidence as "'overwhelming'" as a basis for denying the new trial motion. Instead, the trial judge

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23 Although the rule of *Carpenter* is that overwhelming evidence of guilt can rebut the presumption of prejudice in an inherent bias case, the opinion offers no definition or description of what constitutes overwhelming evidence of guilt. The opinion does not detail or summarize the prosecution's evidence, but merely quotes from the trial judge who found the evidence of guilt overwhelming. No guidance is offered as to how or when a "strong" prosecution case converts to one that is "overwhelming."

stated that the decision he had to make on the motion for new trial was "a close case" and "very, very hard." Presumably, if the trial judge believed the evidence was overwhelming, he would have said so.[24]

The People point to the DNA evidence (derived from sperm) as indicative that the evidence weighed strongly in favor of defendant's guilt. Such evidence, however, only established that defendant had sex with Amber within 72 hours of the homicide. It did not prove whether that sexual activity was consensual or accomplished by force. Indeed, the second jury acquitted defendant of the forcible rape charge. The DNA evidence did not establish that defendant had sex with Amber at or near the time she was killed or that he was with her at the time she was killed. The DNA evidence proved the statutory rape charge, but no more.

While there was considerable circumstantial evidence that defendant committed the homicide, there were other evidentiary considerations that raised doubts about his guilt. For example, there were no eyewitnesses. There was no confession by defendant. The only blood found at the scene belonged to Amber. Not only was there no evidence that defendant had ever harmed his half-sister in the past or had a motive to do so, the uncontroverted evidence from their mother was that the two of them were "extra close" and defendant was "devastated" when he learned Amber was dead. There was evidence that Scott Nelson confessed to the crime.

It took 10 days to present the evidence in this trial. The jury deliberated over the course of six days. During those six days, the jury requested further instruction on the

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[24] We also note that the jury reported they were deadlocked (the record does not reveal how they were split in their voting) after several days of deliberation, which may suggest that the evidence was not overwhelming. After reporting they were deadlocked, Juror No. 7 was discharged for juror misconduct and replaced. Deliberations began anew and a verdict was later returned, but only after the newly constituted jury reported a deadlock on counts 2 and 3. Two reports of jury deadlock tend to refute the claim that the evidence of guilt was overwhelming.

felony murder rule and additional attorney argument on numerous topics. The jury twice reported being deadlocked.[25] These facts are not consistent with a case of overwhelming evidence of guilt.

c. Carpenter, Ledesma, Malone *Do Not Require Affirmance*

Our decision does not run afoul of the authorities cited by the People. The People rely primarily on *Carpenter*, *supra*, 9 Cal.4th 634, *Ledesma*, *supra*, 39 Cal.4th 641, and *In re Malone* (1996) 12 Cal.4th 935 (*Malone*) in support of the argument that Juror No. 9's misconduct in reading the prior appellate opinion does not require reversal. The qualitative and quantitative content of the extraneous material contained in the prior appellate opinion read by Juror No. 9 distinguishes this case from the cases cited by the People.

In *Carpenter*, the high court reversed the trial judge's order granting a new trial. It upheld a capital conviction even though a juror received information that the defendant had been convicted of different but related capital crimes. The underlying facts of those related crimes were introduced in the trial, but jurors were not told the defendant had been convicted of those crimes. The Supreme Court held there was no inherent bias in light of the entire record, since the evidence was "'overwhelming'" (quoting the trial judge) and since the only fact the juror "learned out of court was the verdict of the first jury." (*Carpenter*, *supra*, 9 Cal.4th. at p. 655, fn. omitted.)

This was not the case here. In addition to revealing that a prior jury had found defendant guilty of the same crime for which defendant was on trial, even a cursory reading of the prior appellate opinion uncovered several pieces of extraneous information that were harmful and perhaps devastating to the defense (DNA analysis performed by the FBI connected defendant to the crime, the appellate court described defendant's alcohol consumption that day and characterized the evidence against defendant as a

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25 See footnote 24, *ante*.

strong circumstantial case, defendant testified in the first trial, defendant told police that alcohol made him violent). The *Carpenter* holding would be more analogous if Juror No. 9's outside research resulted in his learning that defendant had been previously convicted and nothing more. (See *Ledesma*, *supra*, 39 Cal.4th at p. 683 ["we do not presume that knowledge that a defendant previously has been convicted and is being retried is incurably prejudicial"].) Here there is so much more.

Ledesma is similar to *Carpenter*. In *Ledesma*, after the defendant's first conviction was reversed, his second jury learned that he previously had been convicted and sentenced to death in the same case when a witness mentioned he had been on death row. (*Ledesma, supra*, 39 Cal.4th at pp. 681-682.) Like *Carpenter*, the *Ledesma* court concluded that there was nothing incurably prejudicial about a jury learning that a defendant was previously convicted of the crime for which he was then on trial. (*Ledesma, supra*, at pp. 682-684.) Again, our case involves considerably more extraneous information than what was wrongfully disclosed in either *Carpenter* or *Ledesma*.

Malone is also cited by the People, but its facts bear no resemblance to ours. In *Malone*, during jury deliberations, the foreperson expressed opinions about the defendant's polygraph evidence based on her own professional study. (*Malone, supra,* 12 Cal.4th at pp. 944, 963.) While this constituted misconduct, the court found the presumption of prejudice rebutted because the foreperson's comments were substantially the same as the evidence and argument presented to the jury. Since the extraneously derived information did not add to or detract from the actual evidence presented, the court found that no prejudice occurred. (*Id.* at pp. 964-965.) In our case, the prior

appellate opinion did just the opposite—it supplied information that was never presented to the jury because it was deemed prejudicial against defendant.[26]

4. *Holloway*

Holloway supports our conclusion. In *Holloway*, the Supreme Court reversed a death conviction. The trial judge denied mistrial and new trial motions based on discovery of jury misconduct after the jury returned guilty verdicts of first degree murder with special circumstances. During the trial, a juror had improperly read a newspaper account which disclosed that, at the time of the charged offenses, the defendant had been on parole for assaulting a woman with a hammer. The trial court had previously ruled that the defendant's parole status and prior offense were inadmissible. (*Holloway*, *supra*, 50 Cal.3d at pp. 1106-1108.) The high court reversed the conviction, finding that the presumption of prejudice had not been rebutted. That single disclosure was enough for the court to find reversible prejudice. (*Id.* at pp. 1110-1111.) Here, there were multiple pieces of highly prejudicial information that Juror No. 9 obtained. Even if no single item was sufficiently prejudicial to warrant reversal, the combination of several items was.

5. Conclusion

We conclude that the presumption of prejudice arising from Juror No. 9's misconduct was not rebutted. Accordingly, the trial court abused its discretion in denying defendant's motion for new trial. (*People v. Staten* (2000) 24 Cal.4th 434, 466; *People v. Perez* (1992) 4 Cal.App.4th 893, 906.) Although our resolution of this issue

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26 While we agree that a trial court's in limine ruling that evidence is inadmissible under Evidence Code section 352 (more prejudicial than probative) is different from deciding whether a jury's acquisition of that same information was prejudicial in light of the entire record (*Holloway*, *supra*, 50 Cal.3d at p. 1112; see also *Carpenter*, *supra*, 9 Cal.4th at p. 655, fn. 2), it does not follow that such rulings are irrelevant on the subject of prejudice.

dictates our reversal, we turn to issues regarding the DNA evidence that might be relevant in case of a retrial.

II. DNA EVIDENCE

A. Introduction

When a perpetrator leaves his DNA behind after committing a crime—in this case, in the form of sperm—his genetic profile can be created from that DNA. When a suspect is identified, his genetic profile is analyzed and compared to the perpetrator's profile. If the suspect's profile matches the perpetrator's profile, the suspect becomes a possible perpetrator and the case against him may proceed. If the suspect's profile does not match the perpetrator's profile, the suspect is exonerated and the case against him is over. (*Pizarro II, supra,* 110 Cal.App.4th at pp. 541-542, 563; *People v. Johnson* (2006) 139 Cal.App.4th 1135, 1147.)

In *Pizarro II*, we likened a genetic profile to a physical profile, where the suspect is found to share a number of the perpetrator's physical traits (rather than genetic loci)—such as hair color, eye color, and height—reported by an eyewitness. The match between their traits directly incriminates the suspect (who is now the defendant) by demonstrating that he resembles the perpetrator and therefore *could be* the perpetrator.[27] But the match alone does not establish the weight of the evidence. Anyone with the same profile could be the perpetrator, and if a large number of people share the profile, the match does not carry much evidentiary weight. Thus, the match requires a second piece of evidence—the statistical frequency of the profile. "The statistical evidence gives the match evidence

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[27] As we noted in *Pizarro II*, a match between the perpetrator's and the defendant's profiles "does not signify an *absolute* match between the entirety of the perpetrator's DNA and the entirety of the defendant's DNA, which would absolutely prove the perpetrator and the defendant are the same person. The match is actually between only a few or several regions of an enormous amount of DNA, and therefore it does not absolutely prove identity. What it does prove is that the defendant *could be* the perpetrator." (*Pizarro II, supra,* 110 Cal.App.4th at p. 576.)

its weight. It is an expression of the rarity of the perpetrator's profile, the size of the pool of possible perpetrators, and the likelihood of a random match with the perpetrator's profile." (*Pizarro II, supra*, 110 Cal.App.4th at p. 542; see also *id.* at p. 576.) "The determination of what is often called the 'significance of the match' is a statistical assessment of *how incriminating* it is that the defendant's profile matches the perpetrator's." (*Id.* at p. 576.) The rarer the profile in the population, the more likely the defendant is in fact the perpetrator.[28] (*Id.* at pp. 542, 576; see also *People v. Johnson, supra*, 139 Cal.App.4th at p. 1147; *People v. Venegas* (1998) 18 Cal.4th 47, 82 (*Venegas*); National Research Council, The Evaluation of Forensic DNA Evidence (1996) p. 127 (NRCII); National Research Council, DNA Technology in Forensic Science (1992) p. 44 (NRCI).)

We turn to a brief summary of the science behind STR analysis, which takes advantage of the genetic phenomenon of STR's and is made possible by the molecular biology process called the Polymerase Chain Reaction (PCR).

DNA's double helix is often compared to a twisted ladder. The side rails of the ladder are composed of a uniform sugar-phosphate backbone. The rungs of the ladder are made of the bases adenine, guanine, cytosine, and thymine (A,G,C, and T). The linear sequence of these four bases along the length of the ladder varies and makes up the

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28 Of course, as more traits are added to the perpetrator's profile, the profile's specificity and rarity increase, and the pool of possible perpetrators decreases. (*Pizarro II, supra*, 110 Cal.App.4th at p. 562.) For example, in 1989, in preparation for the first trial, the samples in this case were tested using RFLP analysis. Only three traits or loci made up the perpetrator's genetic profile, and the frequency of that profile was calculated to be approximately one in 10,000,000 Caucasians and one in 250,000 Hispanics. (*Id.* at p. 552 & fn. 22.) In 2004, in preparation for the second trial, the samples were retested using the more modern STR analysis. This time, 13 loci made up the perpetrator's profile, and the frequency of that profile was calculated to be approximately one in 3.9 quintillion African-Americans, one in 350 quadrillion Caucasians, and one in 4.2 quadrillion Hispanics. The evidentiary weight of the second match increased astronomically.

genetic code that gives DNA its meaning. Two bases form each rung and are bound together in the center in a complementary fashion—A binds to T, and G binds to C. The sugar-phosphate backbone rail is covalently bound, while the complementary bases coming together as rungs in the center are less tightly bound to one another by hydrogen bonds. This allows the linear halves of the ladder to separate for replication.

Although most regions of DNA are identical from one person to the next, some regions vary in sequence and/or length. DNA analysis for the purpose of identification often relies on the comparison of these variable regions. STR's are stretches of DNA composed of repeated blocks of short sequences, often four nucleotides long. The *number of repeats* varies among people, usually within the range of 10 to 20 repeats. The function of these repetitive regions is unknown, but their variability provides an opportunity to identify differences between two people, such as perpetrator and suspect in a criminal case, or father and child in a paternity case.

Because a person inherits a set of chromosomes (22 plus an X or Y) from each parent, every locus has two versions (alleles). These alleles can be the same or they can be different. In STR analysis, the number of repeats in an STR allele (reflected in the length of the allele) gives the allele its name/number. The results of the analysis are produced in a graph (electropherogram) that shows, for each locus, two peaks if the person's two alleles are different (heterozygous), or one larger peak, roughly twice the height of two heterozygous peaks, if the person's two alleles are the same (homozygous). For each peak, the electropherogram labels the allele repeat number and the height of the peak.

Thus, if a person's two alleles at a particular STR locus are both the same length, for example 14 repeats long, the person's genotype is 14,14 and homozygous. If the person's alleles at a locus are different lengths, for example 14 and 19 repeats long, the person's genotype is 14,19 and heterozygous. Several STR loci are tested to create a genetic profile for the perpetrator and for any other relevant persons, such as the victim

and any suspects. For two profiles to match, they must have the same alleles at every locus.[29]

A tool critical to the implementation of STR analysis is PCR. PCR has revolutionized DNA analysis because it is capable of making millions of copies of a target segment of DNA. Thanks to PCR, very small amounts of DNA—theoretically, just one piece—can be copied (amplified) exponentially to produce sufficient target DNA for analysis. This is critical in forensic work where sometimes only trace amounts of DNA can be collected.

PCR's three-step amplification cycle occurs in a very small tube containing a sample of the double-stranded DNA with the target segment (e.g., the evidence DNA), short single-stranded pieces of DNA (primers) designed to bind to the two specific regions flanking the target segment of DNA (primer binding sites), a heat-resistant DNA-building enzyme (a DNA polymerase), the building blocks of DNA (nucleotides),[30] and other required elements. The tube is placed in a thermal cycler for amplification. In the first step, the temperature is elevated to near-boiling to separate (denature) the double-stranded DNA into single strands, breaking the hydrogen bonds between bases and exposing the two template strands to the primers. Second, the temperature is lowered until the primers are able to bind (anneal or hybridize) to the primer binding sites on the single-stranded template DNA. Third, the temperature is elevated slightly and the DNA polymerase synthesizes (extends) DNA from the end of each primer to make a new strand of DNA complementary to the template strand. These new strands serve as additional templates in the following cycles, rendering the amplification exponential. In the first

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29 The STR loci are generally named with letters and numbers that describes their location on a chromosome (e.g. D8S1179, D21S11); others are named with an abbreviation for the name of the gene they are found within (e.g., TPOX is located within the thyroid peroxidase gene; FGA is located within the alpha fibrinogen gene).

30 A nucleotide consists of a base and its connected sugar and phosphate molecules.

few cycles, some long strands are created, but eventually the region bounded by the two primers becomes the overwhelmingly predominant product. This thermal cycle is repeated about 30 times to create an enormous number of copies of the target region. It is by this method that the STR loci are targeted within a person's DNA and amplified so they can be ascertained by observable means, even if the original forensic sample contains very little DNA.

In this case, Myers used the Profiler Plus and COfiler kits and the Prism 310 Genetic Analyzer (the 310 Analyzer), all manufactured by Applied Biosystems, Inc. (ABI), to analyze the 13 STR loci, which had been chosen by the scientific community as the core loci for STR analysis, as well as the X and Y chromosomes for sex identification.

At trial, defendant challenged the admissibility of the DNA evidence and requested a hearing pursuant to *Kelly, supra,* 17 Cal.3d 24. The *Kelly* test is an evidence-screening device for sophisticated scientific evidence that tends to be highly convincing, but not readily understood by lay jurors. (*Pizarro II, supra,* 110 Cal.App.4th at p. 555.) "In the *Kelly* review process, the trial judge serves as gatekeeper, allowing only evidence that is sufficiently reliable and trustworthy to reach the jurors." (*Ibid.*) Because of the immense power of scientific evidence, the *Kelly* test goes to the admissibility, not the weight, of the evidence. (*Kelly, supra,* at pp. 30-32.)

Kelly explained its three-prong test as follows: "(1) the *reliability of the method* must be established, usually by expert testimony, and (2) the witness furnishing such testimony must be properly *qualified as an expert to give an opinion* on the subject. [Citations.] [(3)] Additionally, the proponent of the evidence must demonstrate that correct scientific procedures were used in the particular case. [Citations.]" (*Kelly, supra,* 17 Cal.3d at p. 30; *Venegas, supra,* 18 Cal.4th at p. 78.)

In defendant's 105-page *Kelly* motion to exclude the DNA evidence, he argued that (1) a first-prong hearing was required (a) on the general acceptance of the mixture

interpretation procedure and (b) on the general acceptance of the STR procedure because he was offering evidence that undermined its reliability, and (2) a third-prong hearing was required to establish that correct scientific procedures were used in this case. The trial court refused to hold a first-prong hearing, concluding that a number of published cases had already determined the general acceptance of the STR procedure. The court did agree, however, to hold a third-prong hearing, and it concluded that correct scientific procedures had been followed in this case.

B. Kelly*'s First Prong*[*]

Under the first prong of *Kelly*, a new scientific method is considered reliable when it has attained acceptance in the relevant scientific community. (*Kelly, supra,* 17 Cal.3d at pp. 30-32 [noting California had adopted this test from the federal case of *Frye v. United States* (D.C. Cir. 1923) 293 Fed. 1013 (*Frye*)][31].) "*Kelly* 'does not demand that the court decide whether the procedure is reliable as a matter of scientific fact: the court merely determines from the professional literature and expert testimony whether or not the new scientific technique is accepted as reliable in the relevant scientific community and whether "'scientists significant either in number or expertise publicly oppose [a technique] as unreliable.'" [Citations.]' [Citation.] '"General acceptance" under *Kelly* means a consensus drawn from a typical cross-section of the relevant, qualified scientific community.' [Citation.]" (*People v. Soto* (1999) 21 Cal.4th 512, 519.)

The question of general scientific acceptance may be answered by prior case law: "[O]nce a trial court has admitted evidence based upon a new scientific technique, and

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[*] See footnote, *ante*, page 1.

[31] "Until 1993, [the *Kelly* test] was generally known in this state as the *Kelly-Frye* [test] because this court in *Kelly* had relied on the reasoning of [*Frye*]. In 1993, the United States Supreme Court held that the Federal Rules of Evidence had superseded *Frye* [citation], and our state law rule is now referred to simply as the *Kelly* test or rule. [Citation.]" (*People v. Bolden* (2002) 29 Cal.4th 515, 545.)

that decision is affirmed on appeal by a published appellate decision, the precedent so established may control subsequent trials, at least until new evidence is presented reflecting a change in the attitude of the scientific community." (*Kelly, supra,* 17 Cal.3d at p. 32; *Venegas, supra,* 18 Cal.4th at p. 53.) Thus, a defendant is not foreclosed from showing that a scientific test has since been invalidated or that there has been a change in the consensus of the scientific community concerning the test. (*People v. Allen* (1999) 72 Cal.App.4th 1093, 1100-1101; *People v. Smith* (1989) 215 Cal.App.3d 19, 25.)

We independently review the trial court's first-prong rulings on general acceptance. (*Venegas, supra,* 18 Cal.4th at p. 85.) "[I]n reviewing the scientific acceptance of [a method] de novo under *Kelly,* we are not required to decide whether [it] is 'reliable as a matter of "scientific fact," but simply whether it is generally accepted as reliable by the relevant scientific community.' [Citation.]" (*Ibid.*)

C. Refusal to Hold First-Prong Kelly *Hearing*[*]

Defendant contends the trial court erred in refusing to hold a first-prong *Kelly* hearing. He concedes that the exact type of testing performed in this case, including use of the Profiler Plus and COfiler kits and the 310 Analyzer, had already been found generally accepted under *Kelly*'s first prong by *People v. Smith* (2003) 107 Cal.App.4th 646, 671-672 (*Smith*) (analysis of mixed DNA sample "by means of short tandem repeats utilizing Profiler Plus and COfiler in conjunction with the … 310 Genetic Analyzer is accepted by the scientific community") and *People v. Henderson* (2003) 107 Cal.App.4th 769, 776, 789 (*Henderson*) (in STR analysis, using Profiler Plus and COfiler kits in conjunction with the 310 Analyzer, capillary electrophoresis is generally accepted by scientific community), but he claims the evidence he presented to the trial court undermined the continuing reliability of the STR technology and revealed a change of consensus within the scientific community concerning the technique. He explains that

[*] See footnote, *ante,* page 1.

the 38 exhibits he presented to the trial court contained data and publications that either were not available at the time of *Smith* and *Henderson* or were not considered in *Smith* and *Henderson*. According to defendant, the exhibits proved that various studies found significant reliability problems with the Profiler Plus and COfiler kits and the 310 Analyzer.

First, we note that cases more recent than *Smith* and *Henderson* have reiterated the continued acceptance of the STR analysis by the scientific community. Recently, the court in *People v. Stevey* (2012) 209 Cal.App.4th 1400 determined that STR testing of the Y chromosome did not require a first-prong *Kelly* hearing:

> "As the Attorney General points out, California courts have found that the use of PCR and STR technology has been generally accepted by the scientific community. (*Smith, supra,* 107 Cal.App.4th at p. 665; *Henderson, supra,* 107 Cal.App.4th at pp. 786-787.) In both cases the court refused to undertake a *Kelly* prong-one hearing to determine whether use of the technology in mixed-source cases specifically had been accepted by the scientific community. And in both cases, the courts recognized the additional complications arising from mixed-source samples that might impact on the results' reliability, but concluded that the weaknesses or potential flaws were considerations for the jury in weighing the evidence and determining the accuracy of the results. (*Smith, supra,* 107 Cal.App.4th at pp. 671-672; *Henderson, supra,* 107 Cal.App.4th at p. 788.) These complications did not trigger the need for a *Kelly* evidentiary hearing. [Citation.]" (*People v. Stevey, supra*, at p. 1418.)

In 2008, the court in *People v. Jackson* (2008) 163 Cal.App.4th 313 recognized that STR analysis was generally accepted and concluded that new STR kits need not be subjected to first-prong scrutiny to determine scientific reliability:

> "The DNA amplification in this case was performed by the PCR/STR method. This methodology has been found to be generally accepted in the scientific community. (*People v. Hill* (2001) 89 Cal.App.4th 48, 57 (*Hill*); *People v. Allen* (1999) 72 Cal.App.4th 1093, 1100.) In addition, capillary electrophoresis, the procedure used to analyze the amplified DNA fragments, has been found to have gained general acceptance in the scientific community. (*People v. Henderson*[, *supra*,] 107 Cal.App.4th [at p.] 789.)" (*People v. Jackson, supra,* at p. 324.)

Second, we conclude that the exhibits defendant presented to the trial court do not prove the STR method is no longer generally accepted by the scientific community. In these 38 exhibits, which we have reviewed, there is certainly evidence of valid issues and ongoing concerns about flaws in the STR system, such as allelic dropout (which we address below), but no evidence that the community has rejected STR analysis as unreliable or no longer generally accepts the method as reliable or acceptable. In fact, it remains the standard applied to forensic DNA analysis.

The phenomenon of allelic dropout and null alleles has been known for many years and defendant's exhibits support the conclusion that the STR procedure remains generally accepted despite allelic dropout. Based on the lack of evidence that the scientific community no longer generally accepts the STR procedure as reliable, we conclude the trial court did not err in refusing to hold a first-prong *Kelly* hearing. (See *Kelly, supra*, 17 Cal.3d at p. 32; *Venegas, supra*, 18 Cal.4th at p. 76.)

D. Kelly*'s Third Prong*[*]

The third *Kelly* prong asks: Were the proper scientific procedures *followed in this particular case?* (*Venegas, supra,* 18 Cal.4th at p. 78; *Pizarro II, supra,* 110 Cal.App.4th at p. 554.) "The *Kelly* test's third prong does not apply the *Frye* requirement of general scientific acceptance—it assumes the methodology and technique in question has already met that requirement. Instead, it inquires into the matter of whether *the procedures actually utilized in the case* were in compliance with that methodology and technique, as generally accepted by the scientific community. [Citation.] [¶] … [¶] [Q]uestions concerning whether a laboratory has adopted correct, scientifically accepted procedures for [DNA testing] or determining a [profile] match depend almost entirely on the technical interpretations of experts. [Citation.] Consideration and affirmative resolution

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[*] See footnote, *ante*, page 1.

of those questions constitutes a prerequisite to admissibility under the third prong of *Kelly*." (*Venegas, supra,* at pp. 78-81.)

Although *Kelly*'s first two prongs apply to a new scientific procedure (*Kelly, supra,* 17 Cal.3d. at p. 30), the third prong applies even to evidence derived from a long-standing scientific procedure that has already been found to have attained general acceptance. (*Venegas, supra,* 18 Cal.4th at p. 79 [whether specific steps in FBI's analysis were in compliance with long-standing and accepted methods presented questions of correct scientific procedures properly considered under third prong].)

"The *Kelly* test's third prong does not, of course, cover all derelictions in following the prescribed scientific procedures. Shortcomings such as mislabeling, mixing the wrong ingredients, or failing to follow routine precautions against contamination may well be amenable to evaluation by jurors without the assistance of expert testimony. Such readily apparent missteps involve 'the degree of professionalism' with which otherwise scientifically accepted methodologies are applied in a given case, and so amount only to '[c]areless testing affect[ing] the weight of the evidence and not its admissibility' [citations]." (*Venegas, supra,* 18 Cal.4th at p. 81.)

"'"All that is necessary in the limited third-prong hearing is a foundational showing that correct scientific procedures were used." [Citation.]' [Citation.] Where the prosecution shows that the correct procedures were followed, criticisms of the techniques go to the weight of the evidence, not its admissibility. [Citations.]" (*People v. Brown* (2001) 91 Cal.App.4th 623, 647 (*Brown*).) Similarly, where there is substantial evidence showing both that procedures were followed and that they were not followed, the question is one for the jury to resolve. (*Venegas, supra,* 18 Cal.4th at p. 91.) But where defense evidence establishes a failure in procedure, and that failure is not contradicted by substantial evidence, then the evidence produced as a result of that incorrect procedure is inadmissible. (See *id.* at pp. 91-93.)

In contrast to first-prong issues, the trial court's third-prong conclusions that proper procedures were followed in a particular case are reviewed for abuse of discretion. (*Venegas, supra,* 18 Cal.4th at p. 91.) The appellate court is "required to accept the trial court's resolutions of credibility, choices of reasonable inferences, and factual determinations from conflicting substantial evidence. [Citation.]" (*Ibid.*) "We thus consider whether there is substantial evidence in the record to support the conclusion that the procedures were in fact performed in a manner fully consistent with the underlying science such that they produced reliable results. [Citation.]" (*Pizarro II, supra,* 110 Cal.App.4th at p. 559.)

E. Failure To Follow Correct Procedures Under Kelly*'s Third Prong*

Defendant contends the trial court abused its discretion when it determined that correct scientific procedures had been followed in this case. The following evidence was elicited at the *Kelly* hearing.

1. Steven Myers's Testimony

a. Introduction

Steven Myers, a highly trained senior criminalist at the DOJ lab in Richmond,[32] testified that he began his DNA analysis of the evidence in this case in November 2004. He analyzed the DNA on the vaginal swabs and found a mixture of sperm cell DNA and epithelial cell DNA. He created a 13-loci genetic profile for the perpetrator (the major contributor from the vaginal swab's sperm cell fraction). When he later analyzed the DNA from defendant's reference blood sample, he found that it matched the alleles at all 13 of the loci of the perpetrator's profile. Myers's statistical analysis established that the estimated frequency of that profile, or the chance that a randomly chosen person would have that profile, was approximately one in 3.9 quintillion African-Americans, one in

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[32] Henceforth, the lab, the DOJ lab, and the DOJ refer to the Richmond DOJ lab unless otherwise noted.

350 quadrillion Caucasians, and one in 4.2 quadrillion Hispanics. Myers also analyzed Amber's reference blood sample and found that it matched the alleles at all 13 loci of the epithelial cell fraction from the vaginal swab.

b. Victim Sexual Assault Kit[*]

The victim sexual assault kit contained a sealed envelope holding a vaginal swab. This was the only vaginal swab Myers tested. The vaginal swab bore initials that Myers recognized as belonging to Delia Frausto-Heredia from the DOJ's Fresno lab. Myers chose to test this swab because he believed it had "gone fewer places," had "had the least done" to it, and had been subjected to "less movement around the country" than the other swabs. It appeared to Myers that about one-third of the swab had been sampled previously.[33]

On cross-examination, Myers testified that the swab contained a large quantity of sperm, particularly for the age of the sample. In his opinion, this large quantity of sperm would not be transferrable by contamination, as defense counsel proposed. But Myers agreed that, hypothetically, contamination of a vaginal swab could occur if the analyst touched the end of the swab with a contaminated finger, or if the analyst examined semen-stained underwear at the same time as the vaginal swab. But the analyst would have to place his contaminated finger directly on the end of the swab, and the sperm would not transfer in a large quantity because the swab would be dry. Myers stressed that although the swab was originally analyzed many years ago, labs at that time were cognizant of contamination issues. Myers did not believe it was likely that the vaginal

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[*] See footnote, *ante*, page 1.

[33] On cross-examination, Myers stated that he believed this swab had stayed in the Fresno lab and the other three vaginal swabs had been sent to the FBI. A letter written to the FBI by Frausto-Heredia accompanying the samples to be analyzed stated that three vaginal swabs were being sent; the third already had been analyzed. Myers chose to analyze the swab that had stayed in the Fresno DOJ lab.

swab in this case had been contaminated with sperm from defendant's underwear, especially with the large amount of sperm on the swab. And if someone had contaminated the swab by dipping it into fresh semen, it probably would contain even more sperm than it did.

On direct examination, Myers explained that in the next step of the analysis, he returned the swab material to the tube with the cellular material. He added various chemicals, including an enzyme to break open the cell membranes and lyse the non-sperm cells (i.e., the vaginal epithelial cells), but not the hardier sperm cells After a two-hour incubation at a high temperature, Myers shook the swab material again, removed it, and stored it in the freezer. After centrifugation of the tube, a cell pellet was formed with a solution above it. Myers expected the cell pellet to contain sperm cells and the solution above it to contain the lysed epithelial cells and their contents (including DNA). After he removed and saved the solution, Myers examined the cells in the pellet and realized the pellet contained some epithelial cells that had not been lysed. He repeated the lysing procedure, after which it appeared all the epithelial cells had been lysed.

To the sperm cell pellet, Myers added chemicals, including dithiothreitol (DTT), to lyse the hardier sperm cells. After this step, Myers had two solutions of lysed cells, one containing epithelial cell DNA and the other containing sperm cell DNA. He extracted the DNA from the solutions and quantitated how much DNA was in each extraction.

After Myers removed the cells from the vaginal swab and attempted to separate the epithelial cells from the sperm cells, he used ABI's Profiler Plus and COfiler kits to amplify 13 STR loci and a sex identification locus. The kits included fluorescent primers specific to areas on the DNA containing the STR loci. Myers tested the samples in this case separately from samples in any other case.

After PCR, Myers separated the PCR products (DNA pieces) by size with the 310 Analyzer, a capillary electrophoresis instrument. The solution containing the various

PCR products was loaded (injected) at one end of the capillary tube and the pieces of DNA traveled through a polymer in the tube, drawn by an electrical charge. DNA pieces of the same size traveled together, and each piece's fluorescent tag was recorded as it passed a laser window. The 310 Analyzer measured the amount of time until the DNA pieces reached the laser window, which reflected their lengths, and also the amount of fluorescence they generated, measured in relative fluorescence units (RFU), which reflected the number of copies of each length. Samples of a known allelic ladder (standardized pieces of DNA of various known sizes) and controls were also analyzed for comparison. GeneScan and Genotyper software, also manufactured by ABI, analyzed these data to estimate the length of the DNA pieces and the number of repeats in each piece. The software produced an electropherogram, a graphical display with colored peaks rising from a baseline, and assigned to each peak a number of repeats (made an "allele call") and an RFU count.

On cross-examination, Myers explained that with GeneScan the analyst could set an RFU below which peaks would not be identified. This eliminated peaks that were consistent with stutter, a phenomenon where an extra, shorter copy of an allele is copied during PCR, in addition to the correct copy. This shorter copy is usually one repeat unit (e.g., four nucleotides) shorter than the correct copy. When GeneScan's threshold filter was turned off, the peaks below the threshold would reappear. ABI recommended using a threshold of 150 RFU and, below that, interpreting with caution. The DOJ's threshold was 75 RFU, but Myers generally set the threshold at 50 RFU for completeness, especially with mixed samples. He did, however, only call or identify alleles that were at least 75 RFU. After GeneScan detected and labeled all peaks above the 50 RFU threshold, Genotyper examined those peaks a second time and removed the labels if one of the two peaks at a locus was less than 15 percent the height of the other, a situation that supported a finding of stutter.

c. Mixture Interpretation[*]

From the resulting electropherograms, it was immediately evident to Myers that the sperm cell fraction contained a mixture of more than one person's DNA. In other words, the separation of sperm and epithelial cells had not been complete. When Myers looked at the allele peaks and their intensities at each locus, he determined that the results were consistent with a major contributor, plus some epithelial DNA carryover as a minor contributor. All of the controls tested as expected, and there was nothing about the results that suggested any mistakes had been made. At this point, knowing he would have to interpret the mixture, Myers amplified the sperm cell fraction three more times to remove any variability issues.

Myers explained that the DOJ's general interpretation guidelines included a protocol for interpreting a two-person mixture in which one person can be assumed to be the minor contributor. He explained that the goal in STR mixture interpretation is to determine the major contributor's alleles by assessing the minor contributor's alleles and the peak height ratios. Mixture interpretation can involve a lot of ambiguity because subtle variations in the major contributor can effectively hide the minor contributor's profile. But where the difference between the contributors is fairly significant, the minor contributor's alleles can be subtracted from the mixture, making the major contributor's alleles fairly obvious. When the DNA source is a vaginal swab, the minor contributor to the mixture can be assumed to be the victim's vaginal epithelial cells if the alleles from the victim match alleles in the mixture.

This was the situation in this case. The difference between the contributors was significant, and the minor contributor's alleles matched those in the vaginal epithelial cell fraction. Accordingly, the minor contributor's alleles could be subtracted from the

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[*] See footnote, *ante*, page 1.

mixture to reveal the major contributor's alleles. This mixture interpretation was consistent with DOJ protocols and procedures.

On cross-examination,[34] Myers explained that it was because of the potential variability in PCR that he amplified the DNA in this case three additional times to ensure that the imbalances he saw in the mixture the first time were not due to a rare occurrence, as he explained below. He injected the results of each amplification into the 310 Analyzer twice, creating eight electropherograms. He calculated peak height ratios at each locus by setting the highest peak as 100 percent and determining the percentage of this height for the other peaks. Then he averaged the peak height ratios of the eight injections. Myers stated that the DOJ's STR protocol did not mention using an averaging method. Nor did he think either the ABI user manual or the FBI's STR protocol mentioned it. Myers had not seen anyone average profiles in the manner he had in this case.

Myers explained that STR mixtures are inherently more difficult to interpret than single-source samples. The results from a single-source sample represent the profile from a single person, but in a mixed sample, where the composition of the mixture may be unknown, there may be ambiguity regarding which alleles come from which person. Theoretically, a person's two alleles at a locus should amplify consistently and in exactly equal numbers, producing two peaks of equal height and a peak height ratio of 100 percent. In reality, the two alleles are usually well-balanced with a peak height ratio of at least 70 percent (the height of the shorter peak is at least 70 percent the height of the taller peak). But more peak variability and imbalance can occur for various reasons, and they greatly complicate mixture interpretation.

Myers explained that although the mixture in this case contained three alleles at the D3S1358 locus, he determined that one peak was not the major contributor's because it was only about 20 percent of the shorter major peak. With an intimate sample such as

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34 Until otherwise noted, the following facts were elicited during cross-examination.

a vaginal swab, incomplete separation of the mixture is not uncommon, and he proceeded with his interpretation based on the assumption that the minor contributor was from carryover from the epithelial portion of the vaginal swab.

The DOJ written guidelines on mixture interpretation stated that a sample could be considered a mixture of major and minor contributors if there was a distinct contrast in peak heights among the alleles. The guidelines set no absolute threshold for what was considered a distinct contrast. Theoretically, two analysts could disagree on that question, but Myers was highly doubtful any disagreement could occur in this case.

d. Low DNA or Degraded DNA*

When the initial amount of DNA amplified is extremely low, there will be more variability in the peak height ratio due to stochastic or chance effects. For example, a peak imbalance can occur when the sample of template DNA added in the PCR reaction contains, by chance, a few more copies of one allele than the other. With very low quantities of template DNA, an allele of a heterozygote can drop out entirely.

Similarly, with severely degraded DNA samples, larger alleles may not amplify as well as the smaller alleles because the long stretches of DNA making up the larger alleles are more likely to be broken. In this case, Myers found that the DNA was somewhat degraded, which he expected because the sample was taken postmortem and was many years old.

As the amount of template DNA diminishes, the chance of these irregularities increases. Different amplifications of the same template DNA can produce different peak heights. Myers had observed peak height ratios as low as 35 percent in low-DNA samples that otherwise amplified normally. In those cases, he did not call major and minor contributors because he knew these imbalances could occur with very low levels of template DNA.

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* See footnote, *ante*, page 1.

e. Allelic Dropout and Null Alleles

Myers explained on cross-examination that if the PCR amplification process itself does not occur equally at both alleles, the peak heights will be different. This could occur, for example, if one allele gets a jump-start in the amplification, or if one allele cannot be amplified as effectively as the other due to a sequence variation that prevents a PCR primer from annealing properly to the template DNA. The most extreme form of allele or peak imbalance occurs in the null allele phenomenon, a fairly rare event in which one of the two alleles simply does not amplify and therefore does not appear as a peak on the electropherogram (the allele "drops out"). The phenomenon is fairly rare because most people have the same sequence in these regions, but occasionally people will have a single base difference in the sequence. The sequence difference can affect the binding of a PCR primer to the template DNA's primer binding site in a critical way, such as when the mismatch occurs at the end of the primer where DNA extension will be initiated. If the instability is great enough to prevent copying of that allele, the missing peak will suggest that the allele does not exist. Myers believed null alleles occurred in about one in 1,000 profiles. He explained that null alleles are more common at certain loci. He was aware that null alleles had been found to occur more commonly at the D8S1179 locus in the Chamorro population.

Myers was familiar with the studies demonstrating that ABI kits and Promega kits produced different null allele results. In some cases, one kit amplified one allele and the other kit amplified two alleles, either balanced or imbalanced. Defense counsel asked whether this could lead to a missed exclusion if, for example, the perpetrator were not really a homozygous 8,8 at the TPOX allele and thus defendant's 8,8 would not be a match. Myers responded: "But the person who would have that sample would still type as this same result using this kit. So as long as everyone is typed with the same kit there wouldn't be any false result because the result would be the same." Defense counsel pursued the topic and the following exchange took place:

"Q. Let me see if I follow that. Let's assume for the moment your testing shows—using the [ABI] Profiler Plus kit [defendant] is [an] 8[,]8 [at the TPOX locus], right?

"A. That is correct.

"Q. If the [evidence] sperm sample is in fact an 8[,]9 and in fact [defendant] is an 8[,]8, your conclusion would be that he's excluded as a possible source for the sperm sample; isn't that true?

"A. If the [perpetrator] is an 8[,]9 that would actually type as an 8[,]9, then [defendant] would be obviously excluded.

"Q. Because?

"A. If [the perpetrator is] … [an] 8[,]9 that types as [an] 8[,]8, then everyone who has just the [8] allele visible type with this kit would be included.

"Q. Right. So what you're saying then is hypothetically if you type them with the [ABI] Profiler Plus kit as [an] 8[,]8 and you typed this [evidence] sperm sample [as an] 8[,]8, … in context with that loc[us], [defendant] is not excluded, right?

"A. That is correct.

"Q. That hypothetically if I, as a defense lawyer, chose to go out and type [defendant] with the Promega kit and I [typed him as an] 8[,]9, then what would your conclusion be? Excluded or included?

"A. My conclusion would be also that you need to type the evidence [sperm sample] now using the Promega kit to see what the evidence would type out as.

"Q. So the results would vary depending on what kit you used?

"A. They should be internally consistent within a kit.

"Q. So your testing procedure cannot determine whether [a null] allele is present or not just using that kit?

"A. Well, there are instances where we can have a good indication a [null] allele is present. Because, for example, we know that general balance between the loci. And if we see at a locus that a single allele was detected, but at a much lower level than normal productibility, that is an

indication that you have a [null] allele present. But in instances where you have degradation[,] that gets more difficult.

"Q. You have degradation in this case?

"A. There is some in this case, yes."

Myers agreed that although null alleles are rare, they are increasingly being discovered over time. Myers was familiar with the following statement from John M. Butler's 2005 book, Forensic DNA Typing: Biology, Technology, and Genetics of STR Markers (Butler 2005), at page 135: "A number of primer concordance studies have been conducted in the past few years as use of various STR kits has become more prevalent. An examination of over 2,000 samples comparing the [Promega] Powerplex 16 kit to the [ABI] Profiler Plus and COfiler kit results found 22 examples of allele dropout due to a primer mismatch at seven of the 13 core STR loci …."

Myers made the assumption that allelic dropout had not occurred at the loci that produced a single peak—vWA, TPOX, and CSF1PO. He explained that because he saw no indication of allelic dropout such as a sudden decline in peak height, he made the assumption that the single peak represented a homozygous genotype "based on what is the most common event."

Myers explained that, at the vWA locus, he typed the evidence sperm DNA as a 17,17, even though the electropherogram for the sperm DNA showed a small 16 peak in addition to the 17 peak. He agreed that if the evidence sperm DNA were actually a 16,17 heterozygote, rather than a 17,17 homozygote, defendant would be excluded as a contributor because he was a 17,17 homozygote. In two of the eight runs of the evidence sperm DNA, the 16 peak was too small to be labeled by the software. In the other six runs, Myers had marked the 16 peak as inconclusive.

Myers explained that his determination that the 16 allele was inconclusive did not mean there was no 16 allele present. In fact, in this mixed sample, a 16 allele was consistent with carryover due to incomplete separation of the epithelial DNA. But the

vWA profile was not consistent with a typical sperm contributor with a 16,17 genotype because the imbalance between the alleles was too dramatic for a typical person's DNA. The two alleles, one from each parent, are generally present in equal amounts in the DNA, and when those alleles are amplified, fairly similar amounts of each allele are expected. Thus, the resulting peak heights for the alleles are also fairly similar, often within 80 percent of each other, and usually within 70 percent. Occasionally, the imbalance is greater, but this generally occurs with very low amounts of template DNA (causing stochastic or chance effects), genetic anomalies, and jump-starts in the copying of one allele. In cases like this with ample template DNA, Myers would never expect these two peaks to be from a typical heterozygote (16,17) contributor.

On redirect examination, Myers explained that at the vWA locus, the 16 peak was so much smaller than the 17 peak that in the vast majority of situations it would not be consistent with being from a single donor. But it would be consistent with a mixture due to incomplete separation of sperm and epithelial DNA. The profile of the epithelial fraction was a 16,17 at the vWA locus and the alleles were almost perfectly balanced in peak height, which one would expect with a heterozygote.

f. Same Length but Different Sequence Alleles

On cross-examination, Myers agreed that the STR procedure measures the length of a DNA piece, not its sequence, and he agreed that a person whose allele matches in length but not in sequence is not a match:

> "Q. Do you accept the proposition that someone who has this same length DNA but different sequences is not the same individual?
>
> "A. Yes.
>
> "Q. In other words, if I have a length—just using an example, length 16, but my sequence is a CTG [cytosine-thymine-guanine] and [defendant] has that same loci 16, but his sequence is not a CTG, but some other sequence, your conclusion would be that those two samples did not come from the same individual?

"A. No. Barring any kind of mutation that occurred within the body, etcetera, etcetera, yes. Just as a generality you can have this same length in a piece of DNA and still have two sequences. And studies have looked at families of repeat where you could see one set of lengths came from the same sequence family and at the same locus a similar length could be from a different sequence family. So that's documented, certainly.

"Q. And are you familiar with Dr. Butler's discussion of this issue in [Butler 2005] under a heading called 'Same Length, But Different Sequence Alleles." Page 131. [¶] … [¶] Then if you turn to page 562 of the book, actually lists there, does he not, all of the—and let me back up. [¶] … [¶] What he's discussing there is the fact that people are finding that at certain of the loci that are typically tested—STRs typically tested there are alleles that have exact same length but different sequences, correct? Right?

"A. That's part of it. He also says this—this is important, it is important to realize that from an operational point of view internal allele variation is not significant. Then goes on to say because we are talking about possible loci and those issues the overall concordance of multiple loci lengths take[s] care of any worry about sequence variation falsely including someone.

"Q. You, yourself[,] I think accepted the proposition that if someone is consistent across several alleles, but inconsistent in one, your conclusion is that they're excluded as a possible source, right?

"A. I'm one of those anything can happen [people]. As a purist, yes. On a practical level, that when I begin a case comparing one person against one sample, when you have entire profiles consistent, then the chance that you're actually going to have exclusions as you're talking about is vastly true, they're highly reduced. [¶] And also this is what our population statisticians count in because in creating data bases all of those people who had, for example, a 16 allele in the data base may have had different sequences. So what we are doing is we are saying, [']here is the frequency of people with this length trait regardless of this sequence.['] [¶] So this is why specifically over the course of the entire 13 locus profile this is not a great concern.

"Q. It's a concern to the person who is wrongfully included, is it not?

"[PROSECUTOR]: Objection. Argumentative.

"THE COURT: Sustained.

"Q. You said yourself that if [defendant] and I shared a different sequence at [a] locus you would exclude based on that difference. [¶] Do you recall this question?

"A. Almost definitely would have been excluded. Excluded by other loci also.

"Q. That's an assumption you're making, right?

"A. It's a pretty good assumption.

"Q. That's based on your assumption that you wouldn't see concordance between multi[ple] loci and just one where it doesn't match?

"A. It's based on the knowledge that when you are using 13 STR loci the chances of a random one grabbing two individuals and the[m] having the same profile is just exceedingly rare."

Myers explained that a 13-loci match is exceedingly rare even though it might be expected to eventually occur in the billions of comparisons that can be performed within a massive database of millions of people. A match in that context is different.

Myers agreed that Butler 2005 lists alleles at various loci that have been found to have the same length but different sequence. These are different alleles, but they are not distinguishable by the STR procedure. Myers's STR analysis did not attempt to distinguish the sequence of any of the alleles, and he agreed that if defendant's alleles contained different sequences, "he would still be included based on the lengths, but under the incredible unlikely event that someone would match at all of the lengths and still have different sequences than the evidence [sample], yes, he would be an exclusion." Myers stated that allele length was the focus of most forensic labs because a "huge practical limitation" prevented them from sequencing. If they sequenced, they would complete only a few cases per year.

g. Statistics[*]

Myers generated a report based on his mixture interpretation, including a statistic stating the chance that a randomly chosen person in the population would have the genetic profile of the mixture's major contributor. He used databases of allelic frequencies to estimate how frequently a particular profile would appear in the population. And he used the formula from the NRCII report with a modification referred to as theta.

On cross-examination, Myers explained that he used Caucasian, African-American, and Hispanic databases to perform his statistical calculations. The databases consisted of about 200 people each. Defense counsel asked if the databases had been tested for independence expectations, as recommended by the SWGDAM (Scientific Working Group on DNA Analysis Methods) Revised Validation Guidelines (Forensic Sciences Communications (July 2004) vol. 6, No. 3), guideline 2.7. Myers answered that the databases had been tested as part of a paper by Budowle et al. published in the Journal of Forensic Sciences. The DOJ had not conducted any independence expectation tests on the databases. Myers explained that the guideline referred to tests that examine issues such as Hardy-Weinberg equilibrium,[35] to compare the observed data versus the expected data in a database. Myers was aware of the criticism of the FBI's independence testing as insufficient to test for potential departures from Hardy-Weinberg equilibrium, but Budowle responded to the criticism and Myers agreed with his position.

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[*] See footnote, *ante*, page 1.

[35] Hardy-Weinberg equilibrium refers to the frequencies of alleles and genotypes within a population.

h. Reference Blood Samples[*]

In May 2005, Myers began analyzing the reference blood samples collected from Amber and defendant. Myers received these samples from Agent Smith. Myers had two reference samples for defendant—one from 1989 and one from 2005. Because the reference samples were blood samples, they did not require the differential DNA extraction needed to separate the sperm and epithelial cells. Myers lysed the cells and extracted the DNA from the blood. As with the other samples, he quantitated the DNA, amplified it with the Profiler Plus and COfiler kits, and analyzed the PCR products with the 310 Analyzer and the computer software. Myers tested the three reference samples at the same time, in addition to the various controls. The controls tested as expected, and nothing in the results suggested the testing was not correct.

From these results, Myers generated a genetic profile for both Amber and defendant. Amber's profile was consistent with having come from the same person as the epithelial cell fraction from the vaginal swab that Myers had tested months earlier. The profiles matched at all 13 loci. And all 13 loci of defendant's profile matched those of the major contributor from the vaginal swab's sperm cell fraction.

According to the DOJ's routine practice, Myers ran every sample at least twice through the 310 Analyzer for reproducibility of the result. Myers applied stringent standards to determine whether a peak was an allele or an artifact. The reruns he performed in this case verified that he made the proper calls. He had confidence in the results.

i. Validation[*]

Myers explained the validation procedures for a forensic typing system. The DOJ validated the STR protocol by following guidelines for validation of a new system prior

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[*] See footnote, *ante*, page 1.

[*] See footnote, *ante*, page 1.

to its use. The DOJ's validations went beyond that required by internal validation. Some of the DOJ's studies, including those for the validation of the Profiler Plus and COfiler kits, were consistent with developmental validation, and the results of those studies were ultimately presented at a scientific meeting.

With the Profiler Plus and COfiler kits, the DOJ analysts made very few deviations from ABI's guidelines, and none that changed the fundamental procedure. Those changes were incorporated into the DOJ's written procedure. For example, the DOJ's interpretation guideline required a certain RFU as an absolute minimum, whereas ABI's guidelines allowed interpretation with caution below a certain level. Also, the DOJ performed "smoothing" of the data at a different level, which was recommended by ABI's employees for experienced analysts. In general, the DOJ analysts maintained a lot of contact with ABI. The DOJ analysts validated the smoothing level, but they already knew it was beneficial.

As a part of the DOJ's accreditation, external reviewers examined the lab's validations and determined whether they were sufficient to justify the use of the test. The reviewers informed the DOJ if they believed the validation was insufficient.

On cross-examination, Myers again addressed the deviations the DOJ had made for using the Profiler Plus and COfiler kits. First, the lab's interpretation guideline required an absolute minimum of 75 RFU, whereas ABI's guidelines allowed interpretation with caution below 150 RFU. Second, the lab lengthened the final extension of the PCR thermal cycling from 45 minutes to 90 minutes, based on validation experiments conducted in the lab that showed some PCR products were otherwise not copied to full length. This was especially the case when the reaction contained more than the optimum amount of DNA. The extra extension time on the final cycle allowed extension to finish and adenylation (addition of a final adenosine nucleotide) to occur. Third, the lab performed light smoothing of the data, rather than heavy smoothing. ABI's user manual recommended heavy smoothing, which resulted in more rounded, gradual

peaks, rather than sharp, pointed peaks on the electropherogram. ABI's employees, however, recommended to Myers that more advanced analysts use light smoothing because those analysts could differentiate spurious peaks from others. The lab validated the light smoothing and determined it was a better method. Myers believed ABI's new user manual now recommended light smoothing.

Myers reiterated that the DOJ conducted internal validation studies on the Profiler Plus and COfiler kits before they were used in casework. These studies did not include stutter percentages. Instead, the DOJ relied on ABI's work on stutter percentages. Myers agreed that stutter percentages had varied some in different studies, but the key for most labs was the determination of how conservative they wanted to be with their thresholds.

j. Proficiency Testing[*]

Myers had undergone at least 20 proficiency tests for the STR procedure. The proficiency tests were both internal and external, although he was aware he was being tested. Myers explained that blind proficiency testing requires that no one in the lab, including the supervisors, know the testing is occurring. This type of testing is very difficult to implement. The DOJ lab had voluntarily participated in a feasibility study regarding implementation of blind proficiency testing many years prior to this hearing. The lab got the correct result in the test. The study, however, ultimately determined that blind proficiency testing would be very difficult to implement on a large scale.

Myers explained that the DOJ was audited by the American Society of Crime Laboratory Directors Laboratory Accreditation Board (ASCLD/LAB) and also by the DNA Advisory Board Standards (also known as the FBI Standards) because the lab received federal funding as part of the database program. ASCLD/LAB accredited labs throughout the world, and its accreditation meant the lab was following its minimum standards in areas such as quality assurance, work validation, and training of personnel.

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[*] See footnote, *ante*, page 1.

Myers explained that the DOJ lab had successfully passed the audits by both boards. The lab had been accredited since 1993.

On cross-examination, Myers agreed that accreditation does not guarantee good scientific work. But the ASCLD/LAB auditors thoroughly examined five cases from each analyst at the lab. Myers believed the auditors may have examined his work in this case the last time the lab was audited. According to an audit report, auditors examined 50 forensic profiles that the lab had uploaded to the national index and found that two profiles were inappropriate. One was incomplete and one was inaccurate. Myers agreed that the accreditation process did not prevent instances of sample switching, contamination, or sloppy handling.

k. Quality Control*

The DOJ lab's quality control included the use of various controls for the PCR process and for contamination. The DOJ's facility, protocols, and actual casework were reviewed and inspected by internal committees and by state and federal accreditation and reviewing agencies. Every time an analyst at the lab completed a case, the work underwent a highly detailed technical review. If the reviewer agreed with the analyst's results, the case was then administratively reviewed for proper documentation.

On cross-examination, Myers testified that the lab had a quality control department that was responsible for checking the reagents and the kits used in the STR protocol. Myers explained that it was his practice to clean and decontaminate his lab bench counters by wiping them with water, alcohol, and a bleach solution. He never placed evidence directly on the counters; he always used a clean paper surface. Myers stated that the controls run in this case tested as expected.

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* See footnote, *ante*, page 1.

l. Contamination[*]

Myers noted that flexibility is required in the interpretation of samples that might have been exposed to unknown environmental conditions. Freshly drawn clinical samples do not require the same considerations. The packaging of the 1989 vaginal swab showed no indication that it was one of the swabs sent to the FBI, which Myers thought was an indication that fewer people had handled it. He noted that vaginal swabs, by their nature, are more difficult to contaminate than other types of samples.

On cross-examination, Myers explained that instances of contamination connected to a particular analyst at a particular moment had no bearing on other analyses in the lab. If, however, the contamination was of a reagent used by more than one analyst, the contamination could affect several cases. The lab's quality control department was supposed to catch these instances of contamination. Myers believed the lab had never experienced an outbreak of widespread contamination.

Defense counsel presented Myers with several reports of contamination at the DOJ lab, none of which involved any of Myers's own work. Two reports in September 2004 involved switched samples, not contamination. Others involved contamination from another sample or from the analyst herself. In each report, it appeared that only the particular case had been affected by the contamination.

On redirect examination, Myers reiterated that none of these contamination reports appeared to involve an outbreak of widespread contamination. Myers was not the analyst in any of those cases. He explained that the controls in each analysis and the lab's quality assurance program led to the capture of these instances of contamination and in the resulting reports being produced. The program had done what it was intended to do.

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[*] See footnote, *ante*, page 1.

2. George Frank Sensabaugh, Jr.'s Testimony

a. Introduction

George Sensabaugh was a professor of Biomedical, Environmental, and Forensic Sciences at University of California at Berkeley. He taught various courses involving DNA technology and had published many papers. He had been on the editorial board of the Journal of Forensic Sciences for many years, had served on both National Research Council committees, NRCI and NRCII, and had testified as an expert in approximately 50 cases.[36]

Sensabaugh believed the DOJ lab's STR protocols were "very sound" and generally accepted as reliable. The protocols complied with correct scientific procedure. He reviewed Myers's bench notes in this case and believed Myers's work was "done in a very sound way." He called it "[g]ood solid science." He said the method Myers used would yield scientifically reliable results.

b. Sperm[*]

Sensabaugh explained that Myers's notes stated he observed an average of about 60 sperm per 400x microscopic field with 50 fields. According to Sensabaugh, this was a "pretty good amount of sperm." He explained that this high amount of sperm was not consistent with contamination: "It would be hard to conceive a contamination situation in which that number of sperm would be detected. If one is detecting those, that number of sperm on a swab[,] one would pretty much have to think that the swab [was] either immersed in a dilution of semen or a wet swab was wiped over a semen stain. Something of that sort." He considered "an inadvertent transfer to be very unlikely given those sperm, that number of sperm."

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36 Sensabaugh testified in this case as an expert in forensic DNA technology and molecular biology.

***** See footnote, *ante*, page 1.

c. Vaginal Swab[*]

On cross-examination, Sensabaugh outlined the correct scientific procedure for determining whether semen is present on a vaginal swab. First, a portion of the swab is extracted in saline or TRIS buffered solution. A small portion of that solution is put on a slide and stained with "Christmas tree" stain, which stains sperm heads and tails different colors. The sperm are then examined under a microscope and counted per microscopic field. The extent of bacterial contamination and the presence of epithelial cells (usually vaginal) can be observed. If no sperm are observed, an acid phosphatase or P30 test can be performed to determine the presence of semen. A negative P30 test indicates either that no semen is present or that the threshold is below the level of detection.

Sensabaugh reviewed Frausto-Heredia's June 20, 1989 letter to the FBI lab. In it, she stated she was submitting three of the four vaginal swabs to the FBI. She stated she had tested the fourth one with the following results: "(+) Acid Phosphatase, (-) P30 Rocket, NR on Enzyme Analysis, did detect foreign antigen[.]" Sensabaugh explained that the positive acid phosphatase result indicated the presence of an enzyme that is found at very high levels in semen. Sensabaugh did not know what threshold Frausto-Heredia used, but he assumed she diluted the semen in the range of one in 100 to one in 1,000. Sensabaugh explained that the rocket electrophoresis method is one of the less sensitive and more problematic P30 tests, and it is possible that semen was present below the test's level of detectibility. He assumed the "NR" meant no result on the enzyme assay, and he assumed the test was PGM typing. If the semen sample had been diluted, or if a substantial amount of the semen was no longer present in the vagina, PGM typing would be problematic. Further, PGM degrades in the vaginal environment, and possibly an insufficient amount was recovered from the swab. Frausto-Heredia did not identify the foreign antigen she detected, but Sensabaugh assumed she was referring to ABO activity.

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[*] See footnote, *ante*, page 1.

This information did not tell Sensabaugh very much about the quantity of semen on the swab. Sensabaugh noted that the material on dried vaginal swabs is quite stable for a number of years. He believed there was a moderate amount of semen on the swab, but he explained that the number of sperm was more pertinent because it contains the DNA. Frausto-Heredia stated she found 30 to 40 sperm on the slide, but Sensabaugh did not know if she was relating that to a field or the entire slide. Sperm per field was the usual way of reporting the number of sperm found. Sensabaugh noted that sperm could survive in the vagina for up to about 72 hours.

d. Amplification and Averaging[*]

On cross-examination, Sensabaugh explained that the DOJ's protocol followed correct scientific procedures, and the "basic protocol that was employed, the methods used for amplification, the methods used for the analysis, the amplification products, all of that was according to the standard protocols."

Sensabaugh noted that both positive and negative controls were incorporated into the protocol. The negative controls and the reagent blank controls were indicators that there had been no contamination, which is a concern with PCR. The positive control indicated the procedures worked as expected. A quality assurance sample with a preestablished profile was also included. These controls enhanced the reliability of the testing and provided confidence in the results.

According to Sensabaugh, Myers's STR analysis of both the epithelial and sperm cell fractions used more than a sufficient quantity of DNA to perform the analysis. After Myers's first amplification of the DNA, he reamplified with a few more cycles to try to get more product to bring up weak peaks that might have been at the threshold value in the first amplification. This was routine scientific procedure.

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[*] See footnote, *ante*, page 1.

Sensabaugh also explained it was good scientific procedure for Myers to perform replicates and average the results of those replicates, even though the lab's protocol did not mention these steps. A protocol provides the basic outline and framework of the analytical procedure, but it is not limiting. Rather, it is a baseline from which the analyst works. A protocol should not prohibit things ordinarily done in the course of scientific work. When an analyst encounters a situation that requires something extra to be done, it is good science to do that extra thing. A guideline "does not constrain one from thinking."

Sensabaugh explained that the electropherograms in this case demonstrated that the sperm fraction contained more than two peaks at some of the loci, indicating the presence of a mixture. To determine the extent of variation, Myers repeated the amplifications and injections, and averaged the results. The lab's protocol did not require this, but it was good science to try to get the clearest and most reproducible answer on the composition of mixtures. Sensabaugh had seen other analysts average results.

Sensabaugh explained that averaging takes into account experimental variation that always occurs, providing a more accurate estimate of the true value than any single measurement. Thus, when multiple measurements have been made, the better technique is to determine both the average and the variance to get the best estimate of the true value and the precision of the measurements. If the variance is very large, the average of the measurements is not very accurate and there may be a problem with the measurements, whereas consistent results across multiple replications give the analyst confidence that the result is sound. Looking at each independent analysis separately does not provide the same level of confidence that the results are consistent.

Sensabaugh reviewed each of Myers's eight runs independently to assess whether any different result would be obtained with any one of the runs, and he determined that the eight individual runs gave essentially the same results as the average of those runs,

but averaging provided the best assessment of the true value. Averaging was the appropriate thing to do.

Responding to defense counsel's repeated suggestions that Sensabaugh's research experience had no application to forensic science, Sensabaugh explained: "The contexts [of a research laboratory and a forensic laboratory] are different but the doing of good science is not different between the two. If one … wants to get the best estimate of a measurement then the best way to approach it, and this is very standard scientific protocol, as well as forensic protocol, is to make multiple determinations and then to average the values across those determinations."

Sensabaugh explained the two-fold significance of Myers's having tested the vaginal swab a month before the reference samples. First, defendant's reference sample could not possibly have contaminated the evidence sample (vaginal swab). Second, Myers had no prior knowledge of the reference types and could not have been influenced by a subjective assessment of trying to fit the data to the reference samples.

e. Mixture Interpretation*

Sensabaugh reviewed Myers's mixture interpretation notes and concluded that Myers relied on sound scientific principles and "took a sound approach" to interpreting the mixture. The minor peaks in the mixture tracked with the epithelial cell type that was presumed to originate from the female in the case. There was some overlap in alleles between the epithelial cell fraction and the sperm cell fraction, which is not uncommon in sexual assault evidence, and Myers's approach was an effort to make certain that the mixture was properly interpreted. In his statistical calculations, Myers used the basic formulas recommended by the NRCII report, incorporating the correction for population structure. These formulas were generally accepted. Overall, looking at Myers's bench

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* See footnote, *ante*, page 1.

work and statistical calculations in this case, Sensabaugh believed Myers followed proper procedures and obtained scientifically sound results.

On cross-examination, Sensabaugh stated that the results were entirely interpretable as a mixture of two contributors, one of which was the female from whom the sample was collected. This conclusion was based on a comparison with the epithelial cell fraction, which yielded a genetic profile that was seen at a low concentration in the sperm cell fraction. Sensabaugh examined the peak heights at each loci and determined that Myers's opinions of major and minor contributors were justified. Sensabaugh explained that Myers entered the data, then used software to apply the NRCII formulas and perform the calculations for the frequency of the profile in three major ethnic populations. Sensabaugh verified that the algorithm used by the lab was the correct computational format.

f. Same Length but Different Sequence Alleles

Sensabaugh stated that he believed sequencing of STR alleles was rarely, if ever, done. The probability that two genetically different people would match at 13 STR loci is almost infinitesimal. And sequencing is not an efficient method. The payoff is much greater by testing additional STR loci.

On cross-examination, Sensabaugh explained that it was well known in the field of human genetics that, among people, some STR alleles contain different sequences even though they are the same length. Sensabaugh was aware that several alleles used in STR analysis had been found to show this sequence variation. STR analysis, however, is based only on allele length, not sequence. The concept of sequence variation had been studied for a long time, beginning in the days of RFLP testing, which also compared DNA fragments by length rather than sequence. Sensabaugh agreed that if two samples have different sequences at the same locus, then the DNA samples come from two different people. And he agreed that if even one of defendant's alleles was found to be a

different sequence than the perpetrator's matching allele, then defendant would be excluded as the perpetrator.[37]

According to Sensabaugh, it was nevertheless correct scientific procedure to compare alleles by length without taking into account possible sequence differences "because the statistic that one is using to assess frequency of occurrence is based solely upon the length. And any sequence variants that may be included within an allele of a particular length are all included within that particular statistic." But again he agreed that if sequencing revealed that defendant possessed a variant allele, he would be excluded as a source of the sperm sample.

Sensabaugh explained that STR analysis is more efficient than sequencing for identifying a person to the exclusion of all others. The objective of STR analysis is to test a large number of loci (13 at that time) such that the frequency of occurrence of the profile is infinitesimally small. And while sequencing might occasionally exclude someone, "the chances are that if a person is different that way [in sequence,] they will also be different [in length] at one of the STR loci." Furthermore, based on the rate for single nucleotide mutations (the substitution of one base for another), most sequence variants are relatively uncommon.

g. Error Rate*

Sensabaugh explained that both he and the NRCII report concluded that a lab error rate should be considered separately from the genotype frequency. Sensabaugh endorsed the notion of introducing evidence of an industry-wide lab error rate at trial and then allowing the particular lab to explain why the error rate does not apply to that lab. A lot

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37 Sensabaugh noted that only the STR portions, not the entire genome, would need to be sequenced. Current science was capable of doing this. DNA sequencing was done on a daily basis by scientists all over the world. In fact, entire genomes had been sequenced.

***** See footnote, *ante*, page 1.

of scientists in the field preferred not to introduce error rates at all. Sensabaugh believed that labs with errors in their proficiency testing should be required to explain what they have done to correct their problems. He believed it was fair to ask an analyst if he had ever made a proficiency error. Accredited labs were required to keep records of their analysts' proficiency records.

On cross-examination, Sensabaugh stated the consensus was that an error rate should be introduced on a case-by-case basis because there was no meaningful way to attach an error rate to any single statistical estimate of genotype frequency. If an industry-wide error rate exists, that is probative and should be introduced. And if a lab takes precautions against foreseeable errors, that should also be introduced. A lab should be allowed to present evidence of its own proficiency work and precautions against error. Consistency across multiple determinations reduces the chance that a single determination was made in error. Sensabaugh believed an error rate above one or two percent was unacceptable, and any lab contributing disproportionately to the overall lab error rate should go offline to correct its problems. Sensabaugh explained that in evaluating any evidence, the chance that a mistake or error was made must be assessed. Sensabaugh agreed that an analyst could discuss his individual proficiency testing results as some indication of his individual error rate. When defense counsel asked if this would create the implication that a finite number of proficiency tests accurately estimates an error rate, Sensabaugh answered:

> "Well, that's the problem with presenting error rates in general. [T]here are a number of problems with how you define it. An industry standard error rate based upon proficiency trials. Proficiency trials are truly artificial situations. One should not make mistakes on them, obviously, because they are artificial situations. [¶] … [¶] It would take a very large number of proficiency tests [to compute an analyst's error rate], but the other part of it is that every case has it[s] unique features. And so how do you assess an error rate when you have an old vaginal swab compared to a fresh vaginal swab? How do you compare an error rate when you have an old blood stain compared to a fresh blood stain? How do you compare the

> error rate when you have a blood stain that is on a windowsill as opposed to one that is on a rug? All of these circumstances … are encountered in ordinary forensic practice. And it would be very difficult to provide—to replicate all of them as part of a proficiency trial."

Sensabaugh believed an analyst should go no further than to say that he or she had taken a certain number of proficiency tests and thus far had made no errors. This would not translate into an error rate of zero. Sensabaugh believed the better line of questioning would be to look at the particular elements of a case and question at what point error was possible.

Sensabaugh explained that after the 1996 NRCII report, error rates were no longer a major issue in the field at large, but some people continued to raise questions about them. The difficulty of conducting blind proficiency trials had been demonstrated. Whenever they were attempted, the labs would recognize them. Because broader proficiency testing programs were well-established and the results available, the need for incorporating error rates into the statistic had diminished. Some people thought NRCII was wrong, but Sensabaugh felt those people mistakenly believed proficiency testing could be incorporated into a forensic lab in a production-line basis, as it is in a clinical lab. In fact, that sort of redundancy is built into a forensic case.

h. Statistics*

On cross-examination, Sensabaugh explained that a considerable dispute arose after the 1992 NRCI report regarding the way the report dealt with population genetics and statistical issues. In 1994, Eric Lander from the NRCI committee and Bruce Budowle of the FBI wrote a letter, published in the journal *Nature*, stating that they believed the main population and statistical issues had been resolved, even if some peripheral issues remained. A number of prominent people responded to the letter,

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* See footnote, *ante*, page 1.

stating that the population figures were not good and that accurate estimates of lab error rates were needed.

On direct examination, Sensabaugh stated that the letters were written in 1994, before the 1996 NRCII report. The 12-person NRCII committee, of which Sensabaugh was a member, considered the same issues raised by the letters. In fact, these issues were part of the reason the NRCII committee was created. The committee concluded that the error rate should be a separate consideration from the population statistic.

As for controversy over whether hidden levels of population structure might distort statistics, by the time NRCII was deliberating, there was a considerably larger body of population data suggesting that there was no significant distortion and that correction would compensate for the distortion that did exist.

3. Delia Frausto-Heredia's Testimony—for the Defense*

In June 1989, Delia Frausto-Heredia was employed by the California DOJ crime lab in Fresno. She worked on this case with Gary Cortner and a third analyst. When she received the case, Cortner had already made slides from the vaginal swabs and found sperm on the slides. Cortner's notes stated that he observed about 20 to 25 sperm (some were just heads) on a slide. Two photographs attached to the same page of Cortner's notes showed a single intact sperm on each. Frausto-Heredia explained that the photographs did not show everything Cortner observed; they were simply to illustrate what he found.

Frausto-Heredia's task was to examine the vaginal and penile swabs and defendant's underwear for the presence of semen. She examined the swabs and underwear at different times, as was her practice to avoid contamination. The vaginal swabs and clothing were stored in different locations—the vaginal swabs in the refrigerator portion of the evidence vault and the clothing in the freezer.

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* See footnote, *ante*, page 1.

On June 12, Frausto-Heredia examined the vaginal and penile swabs. First, she removed the victim sexual assault kit from the refrigerator portion of the evidence vault. The four vaginal swabs were together in one envelope. She tested one swab for acid phosphatase and got a positive result. She explained that acid phosphatase is present in high levels in seminal fluid and in low levels in other body fluids, such as vaginal secretions. A positive acid phosphatase test is presumptive for semen. Frausto-Heredia also tested the swab for the presence of the P30 protein, also presumptive for semen, but got a negative result. Frausto-Heredia also tested the swab for PGM, another highly unstable protein found in seminal fluid. She was not surprised to get no results. She explained that these three unstable proteins degrade quickly. They begin degrading immediately inside a deceased victim, and they degrade quickly when the sample is not stored properly, such as when the sample is not air dried or not stored in a paper bag. Sperm cells, by contrast, are extremely stable.

Frausto-Heredia could not estimate the number of sperm that would be collected 12 hours after ejaculation. She explained there were too many variables, including how much of the sample was collected. For example, nurses tended to collect more of the sample pooled in the cervix, whereas coroners tended to collect less by swabbing the vagina. In a deceased victim, the seminal fluid immediately begins to degrade, whereas the sperm does not degrade quickly. In her cases, Frausto-Heredia had observed between zero and hundreds of sperm per slide.

After Frausto-Heredia examined the vaginal swabs, she returned them to the victim sexual assault kit and placed the kit back in the refrigerator portion of the evidence vault.

At this point, Frausto-Heredia replaced the paper cover on her work surface. Then she removed the suspect sexual assault kit from the refrigerator portion of the evidence vault and tested defendant's penile swab for acid phosphatase. The result was negative.

A week later, on June 19, Frausto-Heredia examined defendant's underwear. The only test she performed on defendant's underwear was the acid phosphatase test, which was negative. Nothing suggested that seminal fluid was present on the underwear. She found some stains that fluoresced under the laser, but they may have been urine. Frausto-Heredia was quite certain there was no seminal fluid on defendant's clothing. The penile swab was also negative for acid phosphatase. Frausto-Heredia explained that based on the time period and the manner in which the items were preserved, she would have expected a positive acid phosphatase result if seminal fluid were present, as it was on the vaginal swabs.

After Frausto-Heredia examined the vaginal swabs, she gave them to O'Clair. O'Clair did not take possession of defendant's penile swab or underwear.

On cross-examination, Frausto-Heredia again explained that the photographs of sperm on a slide in Cortner's notes showed only a portion of a slide. The photographs were merely representative of what was on the slides.

The results Frausto-Heredia obtained on the acid phosphatase, P30, and PGM tests were not inconsistent with the presence of sperm on the slide because these three components are all very unstable compared to sperm. Frausto-Heredia had worked on many cases where she had gotten no results on these three tests, then years later found sperm that yielded DNA for profiling.

4. Trial Court's Ruling*

The parties submitted on the written briefs, and the trial court ruled as follows:

> "The Court finds that the evidence presented at the hearing through the two witnesses that were presented by the Prosecution[,] taking into consideration the testimony provided by the witness for the Defense, are sufficient that the evidence established that the PCR/STR DNA testing was done in this case in a proper fashion. It was performed by a qualified

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* See footnote, *ante*, page 1.

expert and it was … a sound application, a correct application of scientific procedures and it's generally accepted in the scientific community. And it resulted in correct scientific results.

"I find in a majority of the—and that deals with like basically the other first prongs, and the second prong, and the third prong as set forth in Brown[, *supra*, 91 Cal.App.4th 623] and Venegas[, *supra*, 18 Cal.4th 47]. And I find that the evidence should be permitted to go to the jury.

"The correct scientific procedures were used in this particular case. There [are] some certain questions about whether or not there is some sort of contamination. There [are] some questions about handling of the documents. But as I indicated earlier in my prior rulings, that those go to the weight of the evidence, not to its admissibility.

"You know, in doing—I realize this is a case where we have to do a case specific inquiry. In all of the evidence that we had that was presented by the Prosecution with really no defense evidence to the contrary other than the evidence that you could arguably say is contrary and the materials that were exhibits. Those, again, didn't convince me that there was anything that was improperly done. And that the correct scientific procedures were not used.…

"And so, I could try and address some of these other things, you know, as to the thing and I'm thinking it probably might be a good idea to do that. I think we've already addressed the contamination issue. The lack of a blind proficiency testing. You know, I don't think that's, you know, that much of an issue, because the lab has undergone and passed proficiency testing.

"And a failure to provide sequenc[ing]. Again, there's no evidence of failure to provide the sequenc[ing] is not generally accepted in the community. The failure to apply the FBI protocols and all. And again, in relationship to that, while not all the FBI protocols may have been followed in regards to the matter, the lab has still been certified and accredited by the ASCLD as having scientifically accepted … protocols and procedures. So that's sufficiently been done.

"The big issue on the … population data base is basically the basis of this case being reversed on its last occasion. And argued again by the Defense here, the fact of, you know, that they say that the population data base science tests were inadequate. You know, they were adequate. The same data base that's being questioned in this case has been accepted in the case of People vs. Wilson[, *supra*, 38 Cal.4th 1237] even though it excludes

one data base in relationship to the Asians. So I think that issue has pretty much [been] taken care of.

"You know, in this case, you know, Mr. Myers did follow the appropriate, you know, testing procedure as set forth in the Profiler Plus and the Cofile[r] PCR and STR kits. Those were used and they were, and those kits have been found acceptable in the general, you know, scientific community and there's case law of People vs. Henderson[, *supra*, 107 Cal.App.4th 769] that addresses that. And the witness—even Dr. Sensabaugh said the averaging of the multiple runs was good [science] and procedures that were used were consistent with that protocol.

"We've already addressed the chain of custody issues as well. So the Court's going to allow the DNA testing. Of course you're going to be able to attack that by your own witnesses, you know, as to whether or not it is sufficient. But it doesn't go to its admissibility. Again, that all goes to its weight.

"So that takes care of that.…"

5. Defendant's Contentions

a. Blind Proficiency Testing*

Defendant first argues that although the DOJ lab was accredited, it failed to conduct the blind proficiency testing required by generally accepted scientific procedures. Defendant states that the 1992 NRCI report "explicitly makes blind proficiency testing a necessary prerequisite to admission."[38]

The People respond that the more recent 1996 NRCII report demonstrates that the NRC does not require blind proficiency testing.

Defendant replies: "NRC has specifically noted that *blind* proficiency testing is entirely different and indeed, 'provides a truer test of functional proficiency because the

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* See footnote, *ante*, page 1.

38 Defendant quotes this portion of NRCI: "[C]ourts should require that a proponent of DNA typing evidence have appropriate accreditation—including demonstration of external, blind proficiency testing (as well as other accreditation that might be mandated by government or come to be generally accepted in the profession)—for its evidence to be admissible." (NRCI, *supra*, at pp. 106-107.)

analysts will not take extra care in analyzing samples.' ([NRCII, *supra*,] at p. 79.)" He states that, despite the difficulties in administering blind tests, "NRCII nonetheless recommends that 'some of the tests should be blind.' ([NRCII, *supra*,] at p. 88.)"

As the parties recognize, NRCII addresses not only the benefits of blind proficiency testing, but also the practical difficulties in administering it. Defendant is wrong that NRCII states blind proficiency testing "'provides a truer test of functional proficiency.'" NRCII states instead: "*It has been argued* that full-blind testing provides a truer test of functional proficiency because the analysts will not take extra care in analyzing samples. *Whether or not that is so,* this form of proficiency-testing evaluates a broader aspect of laboratory operation, from the receipt of the 'evidence' at the front desk through analysis and interpretation to final reporting." (NRCII, *supra*, at p. 79, italics added.) As for the practical application of blind proficiency testing, NRCII acknowledges:

> "The logistics of full-blind proficiency-tests are formidable…. The TWGDAM [Technical Working Group on DNA Analysis Methods] guidelines recommend one full-blind proficiency test per laboratory per year if such a program can be implemented. The DNA Identification Act of 1994 required that the director of the National Institute of Justice (NIJ) report to Congress on the feasibility of establishing a full-blind proficiency-testing program. The NIJ has reported that, although several of the large laboratory systems conduct blind testing in-house, there is no blind, external, DNA profi[ci]ency-testing program generally available to public or private laboratories. The report mentioned some potentially serious issues with blind testing, including the cost of implementation, the risk that DNA data from an innocent donor to the test might end up in criminal DNA databanks, and the chance that the test would impose excessive costs and time demands on law-enforcement agencies. The NIJ has contracted a study to review current testing programs and to examine alternative ways of performing blind tests." (NRCII, *supra*, at pp. 79-80.)

Furthermore, while NRCII does recommend that some of the proficiency tests should be blind, defendant's characterization of that recommendation is also misleading. NRCII's recommendation states:

> "Regular proficiency tests, both within a laboratory and by external examiners, are one of the best ways of ensuring high standards. *To the extent that it is feasible, some of the tests should be blind.*
>
> "**Recommendation 3.2: Laboratories should participate regularly in proficiency tests, and the results should be available for court proceedings**." (NRCII, *supra*, at p. 88, italics added.)

We conclude that the authority cited by defendant does not support the proposition that blind proficiency testing is required by generally accepted scientific procedures. And, as the trial court found, there was ample evidence that the DOJ lab was fully accredited and Myers's proficiency fully tested. Myers had undergone at least 20 proficiency tests for the STR procedure alone. The DOJ lab had participated in a blind proficiency testing feasibility study in which the lab obtained the correct result, but which led to the conclusion that blind proficiency testing would be very difficult to implement on a large scale. Myers explained that because the DOJ lab was accredited by ASCLD/LAB (since 1993), it was required to adhere to certain standards of quality assurance, work validation, and personnel training.

According to Sensabaugh, the difficulty with blind proficiency tests was that labs always recognized them. Broader proficiency testing programs were well-established and the results were available. He believed analysts should have to account for their proficiency errors.

The trial court did not abuse its discretion when it determined that a lack of blind proficiency testing did not constitute incorrect scientific procedures.

b. Deviation from Protocol without Validation[*]

Defendant contends the DOJ lab deviated from ABI's protocol in ways that had not been scientifically validated for reliability. Specifically, he points to the use of a different allele call threshold and a different level of data smoothing. He concedes that

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[*] See footnote, *ante*, page 1.

Myers testified the DOJ had validated its deviations, but says he failed to establish exactly *how* it had done so.

At the *Kelly* hearing, the uncontroverted evidence established that the DOJ validated its STR protocol according to validation guidelines, and its studies were more extensive than what was required for internal validation. Some of its studies, including the validation of the Profiler Plus and COfiler kits, reached the level of developmental validation and were presented at a scientific meeting. In addition, the lab's validations were externally reviewed for sufficiency as part of the lab's accreditation. Furthermore, there was no evidence that the DOJ's allele call threshold was unreasonable or improper. Different labs adopted different thresholds, depending on how conservative they chose to be. As for data smoothing, the advisors at ABI personally recommended light smoothing for analysts with advanced experience. The DOJ validated the light smoothing level. Finally, Myers explained that none of the changes the DOJ made altered the fundamental procedure. In sum, there was substantial evidence from which the trial court could determine that the protocol followed by Myers was adequately validated. The court did not abuse its discretion.

c. Contamination[*]

Defendant maintains that the prosecution failed to demonstrate through qualified experts that both law enforcement and the labs in this case used generally accepted methods for collecting, handling, and testing the vaginal swab. Defendant complains that the DNA on the swab was collected during Amber's autopsy in a mortuary and allowed to air dry. He claims that by the time the vaginal swab reached the lab in 2004, it "had repeatedly come into contact with [defendant's] biological samples, and his belongings." He asserts that "the record affirmatively suggests that contamination *had* occurred." He

[*] See footnote, *ante*, page 1.

further argues that Myers's testimony failed to establish that he followed generally accepted methods to avoid contamination when he tested the DNA on the vaginal swab.

We agree with the trial court that these issues fall outside of *Kelly*'s third prong. As *Venegas* explained, "[s]hortcomings such as mislabeling, mixing the wrong ingredients, or failing to follow routine precautions against contamination may well be amenable to evaluation by jurors without the assistance of expert testimony." (*Venegas, supra,* 18 Cal.4th at p. 81.)

Contamination is a concept readily comprehensible to jurors for their evaluation and weighing at trial. (*Venegas, supra,* 18 Cal.4th at p. 81.) Thus, it is an issue going to weight, not admissibility, and the trial court did not abuse its discretion in so concluding. At trial, the jury was presented with ample evidence regarding the collection, handling, and testing of the vaginal swab, defendant's clothing, and other items, from which the jury could weigh the value of the resulting biological evidence.

Moreover, we disagree with defendant that the *Kelly* record suggests contamination occurred at any stage in this case. Indeed, the evidence supported the contrary conclusion. Myers testified that the vaginal swab contained far too much sperm to have been transferred by contamination. He explained that dried vaginal swabs are not prone to contamination. He thought the defense's contamination scenario was unlikely in any lab, even one in the 1980's. He also explained the procedures he followed to eliminate or reveal contamination in the lab, on his own work bench, and in his PCR reactions. The controls he used in this case revealed no evidence of contamination. He explained that the reports of contamination presented by the defense were not connected with this case, his own work, or lab-wide contamination.

Similarly, Sensabaugh testified that the large amount of sperm on the vaginal swab was not consistent with contamination. He could hardly imagine how contamination could transfer that amount of sperm and he considered an inadvertent transfer very unlikely. Sensabaugh explained that Myers could not have contaminated the vaginal

swab with defendant's reference blood sample because he examined the blood a month after he examined the swab. And the controls Myers used in the PCR reactions established there had been no contamination in those reactions.

Frausto-Heredia testified that she stored and examined the swabs and underwear separately to avoid contamination.

d. Averaging*

Defendant complains that Myers's averaging of the STR results was "purely of his own invention," not part of any written protocol for interpretation of data, and therefore not compliant with accepted scientific procedures. All of the evidence, however, supported the conclusion that averaging was correct scientific procedure.

Myers explained that he performed the multiple amplifications and injections to ensure that the imbalanced peaks in the first amplification were not due to a rare stochastic occurrence. And, although there was no evidence of a written STR protocol calling for this averaging, the uncontradicted evidence established that it was simply good scientific procedure. Despite defense counsel's relentless attacks, Sensabaugh repeatedly explained that the averaging of multiple measurements is such a standard principle of scientific research and forensic protocol that it need not be written into a basic protocol. He explained that the best estimate of a true value is obtained by determining both the average and the variance of multiple measurements. Averaging was the correct thing for Myers to do.

In any event, as Sensabaugh explained, in this case the variance between measurements was small and therefore each individual measurement would have supported the conclusion arrived at through averaging. In other words, averaging was the correct and appropriate method, but it did not affect the results in this case. The trial court did not abuse its discretion.

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* See footnote, *ante*, page 1.

e. Triallelic Patterns[*]

Defendant contends Myers refused to consider the possibility of a triallelic perpetrator, which would have excluded defendant as a contributor. He points to the trialellic pattern of the 23, 25, and 26 alleles at the FGA locus. Unfortunately, defendant cites no evidence to support his conclusion that Myers did not consider this possibility. In fact, for record authority, defendant cites his own posthearing brief, but no evidence from the hearing itself. Our reading of the record demonstrates instead that Myers was a well-trained and highly experienced analyst who was capable of considering the many facets involved in mixture interpretation, including whether a third peak most likely reflected a minor contributor in a mixture or a triallelic anomaly.

Myers explained it was immediately clear that the sperm fraction was in fact a mixture. Indeed, the D21S11 locus showed four peaks in the sperm fraction. And because (1) the DNA source was a vaginal swab, (2) the difference between the contributors' peak heights was significant, and (3) the minor contributor's alleles matched those in the vaginal epithelial cell fraction, he assumed the minor contributor was Amber and he subtracted out her peaks, leaving the perpetrator's peaks. This procedure was in accord with the DOJ protocol.

For example, although the sperm fraction showed three peaks at the D3S1358 locus, Myers concluded that only two of the peaks belonged to the major contributor because the third peak was only about 20 percent of the shorter major peak. According to his notes, the average ratio of peak heights at that locus was 100 percent for the 14 allele, 75 percent for the 15 allele, and only 16 percent for the 16 allele. In compliance with the DOJ protocol, Myers interpreted the much smaller peak as carryover from Amber's epithelial DNA, which contained 14 and 16 alleles.

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[*] See footnote, *ante*, page 1.

Similarly, at the FGA locus, Myers's notes state that the average ratio of the peak heights at that locus was 100 percent for the 26 allele, 93 percent for the 25 allele, and only 19 percent for the 23 allele. The epithelial DNA contained 23 and 26 alleles.

We also note that the DOJ's written STR protocol addressed genetic anomalies, such as triallelism, as follows:

> "Peak height ratios lower than 70% may indicate a mixture, especially when seen at more than one locus. However, a single-source sample may also exhibit peak height ratios below 70%, especially when peak heights are less than 200 RFU. Analysts should consider results at all loci when interpreting samples that exhibit peak height ratios of less than 70%. Depending upon the sample source, the loci in question, the number of loci affected and the percent disparity between allele peak heights, the sample may need to be re-amplified and typed. All loci should be evaluated in making this determination.
>
> "The following are also considerations in interpreting sample profiles: [¶] The presence of more than two alleles per locus, especially at more than one locus, may indicate a mixture. *However, some individuals may exhibit more than two alleles at one locus due to genetic anomalies (e.g., trisomy, chromosomal translocation, mosaicism, and chimerism).*" (Italics added.)

We see no evidence that Myers neglected or refused to consider the possibility of triallelism in his interpretation. The trial court did not abuse its discretion.

f. DNA Sequence Variations

Defendant raises two issues regarding variations in DNA sequence, both of which defense counsel vigorously pursued at the *Kelly* hearing: (1) alleles of the same length but different sequence and (2) peak height imbalance and allelic dropout. Defendant contends Myers's failure to investigate these issues constituted improper scientific procedure.

As the evidence in this case established, most regions of DNA are the same between people. But mutations, such as the substitution of a single nucleotide for another, create sequence variations (nucleotide polymorphisms) even in fairly stable

sequences. And, as Myers and Sensabaugh testified, a difference in sequence between two DNA samples demonstrates that the DNA samples come from two different people.[39] The issues defendant raises here have to do with the ability of the STR system to cope with these sequence variations.

1. Introduction

STR alleles are copied by PCR, and PCR relies on the binding of primers that have been designed to match the nearly universal sequences in the regions flanking the STR alleles. These flanking sequences are used as primer binding sites during PCR. With most people's DNA, the primers bind properly to the primer binding sites, and then the DNA between the primers is successfully copied. But if a person's DNA contains a mutation within a primer binding site, PCR's ability to amplify the allele may be affected. The fairly universal sequence is not present in the mutated primer binding site, and thus the now-mismatched primer does not bind properly to it. This can debilitate or even prevent amplification of the allele. Consequently, few or no copies of the allele are made, and the resulting allele peak is either small or nonexistent (null)—the result ranges from peak height imbalance to allelic dropout. When the allele drops out, which is the most dramatic consequence, a heterozygous genotype falsely appears to be a homozygous genotype at that locus because only one of the two alleles has been amplified.[40]

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[39] Our discussion is also based on the assumption that two samples from the same person contain identical DNA, even when they originate from different cell types, such as sperm and blood. We do recognize that there are instances in which a mutation occurs in the DNA in one part of the body (e.g., sperm or cancerous tissue) but not in the DNA in another part of the same body (e.g., blood), and instances of other genetic phenomena, such as chimerism (e.g., due to the fusion of two fraternal twin zygotes into a single zygote); however, we imagine these to be fairly rare scenarios. (We also recognize that some mutations are heritable and might be found in family members, but we assume this is not relevant to most forensic comparisons between a perpetrator and suspect.)

[40] When null alleles are discovered, they are catalogued on the Short Tandem Repeat DNA Internet DataBase (STRBase) maintained by the National Institute of Standards and

By contrast, when a person's DNA contains a mutation within the repeat motif of the STR allele itself, rather than the flanking regions, PCR's ability to amplify the allele is not affected. The primers bind to their binding sites, which are unaffected by the internal mutation, and the mutated stretch of DNA between the primers is copied, regardless of its sequence. Because the resulting amplified alleles are analyzed by length, not sequence, the sequence variation goes undetected by the STR procedure. The allele is considered a match to an allele of the same length, even though its sequence is actually different.[41]

2. Same Length but Different Sequence Alleles

Defendant contends that because of the known existence of sequence variants within the STR alleles, his alleles should have been sequenced to determine if they matched the perpetrator's alleles in sequence, not just in length. He rejects the explanation that sequencing in forensic cases is impractical, and he asserts that a convenient procedure does not amount to a correct one.

At the *Kelly* hearing, both Myers and Sensabaugh explained that the STR procedure cannot recognize a difference in sequence that might be contained within an allele because the STR procedure measures allele length, not allele sequence. And they both agreed that a difference in sequence would exclude defendant as the perpetrator.

Technology and available at http://www.cstl.nist.gov/strbase under Null Alleles. See also Butler 2005, *supra*, at page 136.

41 When sequence variants are discovered, they are also catalogued on the STRBase (http://www.cstl.nist.gov/strbase under Variant Allele Reports), which reports 409 variants of the 13 core STR alleles, as of May 17, 2013. See also Butler, Advanced Topics in Forensic DNA Typing: Methodology (2011) (Butler 2011) appendix 1, pages 549 through 603.

For a discussion on the general topic of sequence variation, see Butler, Forensic DNA Typing: Biology and Technology behind STR Markers (2001) (Butler 2001) at pages 89 through 93.

Sequencing, however, is inefficient, has huge practical limitations, and is rarely done. They explained that STR testing for length alone is acceptable because of the extreme unlikelihood that a sequence variant would exist in a person whose alleles match in length at 13 STR loci. The chance of an STR match at 13 loci is infinitesimally small, and if a defendant's alleles do match in length at all 13 loci, it is highly unlikely that any of those alleles fail to match in sequence. If a person differs in sequence, he will likely differ in length at one or more loci. Furthermore, sequence variants are relatively uncommon.[42]

We conclude that the trial court did not abuse its discretion in finding that Myers followed correct scientific procedure by using the STR procedure and not sequencing defendant's alleles to test for sequence variants. The evidence before the trial court established that although the STR procedure cannot discern sequence variants, its ability to discern length variants is extensive enough that a match at 13 loci is astronomically rare. The evidence therefore established it was extremely unlikely that defendant's alleles, which matched the perpetrator's alleles in length at 13 STR loci (the chances of which were infinitesimally small), would fail to match in sequence.

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[42] Both Myers and Sensabaugh noted that allele sequence is similarly not considered in the *statistical* aspect of the STR procedure. Myers explained that statisticians rely on the length, not the sequence, of the STR alleles when they determine the frequencies of the alleles in the population. The resulting numbers define the frequency of people with a particular allele length, regardless of sequence. He explained that this is a reason that sequence variation is not a concern over the course of an entire 13-locus profile. Likewise, Sensabaugh testified that it is correct scientific procedure to compare allele lengths without accounting for possible sequence differences because the statistics used to estimate the frequency of the alleles are based solely upon length and any sequence variants are included in those statistics. This testimony explains that the STR statistical analysis (to determine allele frequencies) accounts for the fact that the STR procedure measures only allele length, and not sequence. But it does not address the *match* itself—whether a defendant's alleles actually match the perpetrator's alleles—which is the issue here.

3. Allelic Dropout and Null Alleles

Defendant also contends that Myers failed to account for the possibility of allelic dropout and null alleles in the sperm fraction at the vWA locus where the results showed a small 16 peak and a large 17 peak. Myers interpreted these peaks as a homozygous 17,17 genotype, which matched defendant's 17,17. Defendant suggests that the small 16 peak might have been the result of a peak height imbalance caused by a mutation in the perpetrator's DNA that negatively affected amplification of the 16 allele, causing it to nearly drop out. Defendant argues that Myers should have followed published protocols to "recover" a possible null allele—such as lowering the annealing temperature or using degenerate primers[43] (which we discuss below)—to determine whether the sperm fraction was in fact heterozygous 16,17, rather than what falsely appeared to be homozygous 17,17 due to allelic dropout.

The People respond that defendant's argument suffers from a fatal flaw because Myers testified that using the same kit/primers on all the samples in the case eliminated any false results. The People paraphrase: "In other words, while a particular sample may produce a different result on a particular locus if two different kits were used to test that locus, this same problem would not occur if the same kit were used to test all the evidence (i.e., the vaginal swab and the reference samples) in a particular case."[44]

At the *Kelly* hearing, Myers testified that allelic dropout is fairly rare because the regions flanking the STR alleles are quite consistent among people. He was not concerned that a missed exclusion (i.e., a false match or inclusion) might occur because use of the same kit on everyone's DNA within a case ensures that no false results are produced. Myers explained that sometimes an analyst has a "good indication" that allelic

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43 Defendant cites Butler 2001, *supra*, at pages 90 through 93.

44 The People cite Butler 2001, *supra*, at page 93 and Butler 2005, *supra*, at page 137.

dropout has occurred due to peak height imbalance. In this case, there was no such indication, and the existence of a mixture with Amber's DNA explained the presence of the very imbalanced peaks in the perpetrator's sample.

a. The Theory

Butler and other authors propound the theory that allelic dropout is not an issue in criminal cases when the same primers (and PCR conditions) are used on both the perpetrator's evidence sample and the defendant's reference sample—as long as the two samples come from the *same person*. While we agree with this theory, we believe it fails to consider and account for the possibility of an *innocent* defendant, as we will explain.

We begin with some statements of this theory. Butler explains in Butler 2001, in Butler 2005, and also in his 2009 book, Fundamentals of Forensic DNA Typing (Butler 2009):

> "No primer set is completely immune to the phenomenon of null alleles. However, when identical primer sets are used to amplify evidence samples and suspect reference samples, full concordance is expected from biological materials *originating from a common source*. *If the DNA templates and PCR conditions are identical between two samples from the same individual,* then identical DNA profiles should result regardless of how well or poorly the PCR primers amplify the DNA template." (Butler 2009, *supra,* at p. 223, italics added; see also Butler 2005, *supra,* at p. 137 & Butler 2001, *supra*, at p. 93.)

Butler also explains in a recent article:

> "Although usually rare (≈0.1%), primer-binding-site mutations can give rise to typing results that do not reflect the true underlying alleles present in a DNA sample. Most university and forensic labs conduct population genetic research or casework with only a single STR typing kit. Therefore, investigators do not typically have the opportunity to cross-check results with different PCR primer pairs. It is worth noting that, *by using consistent primers within a laboratory, question and known samples will agree if both contain the same primer-binding-site mutation.* In other words, false homozygotes caused by allele dropout in a heterozygote when a primer fails to anneal properly and extend are *not a problem within a laboratory*. It is with interlaboratory comparisons and DNA databases

supplied with results from multiple laboratories using different kits where potential null alleles can cause *artificial mismatches*." (Butler, et al., Variability of New STR Loci and Kits in US Population Groups (2012) available at http://www.promega.com/resources/articles/profiles-in-dna/2012/variability-of-new-str-loci-and-kits-in-us-population-groups, as of May 17, 2013, italics added, fns. omitted.)

Another source states:

"In processing casework, samples typically are amplified using the same kit or primer set. Thus, any primer mismatch present in the [defendant's] reference sample would also be present in an evidence sample *that originated from the same individual*." (Leibelt et al., *Identification of a D8S1179 primer binding site mutation and the validation of a primer designed to recover null alleles* (2003) 133 Forensic Science International 220, 225, italics added.)

Another says:

"Null alleles are STR alleles that, possibly because of a mutation in the primer [binding] sequence, are not amplified by PCR. A null allele can cause an individual who is truly heterozygous to be wrongly recorded as homozygous for the allele that is amplified. Individual null alleles are difficult to detect, but a high prevalence of null alleles at a locus may be detected via excess homozygosity [citation]. See Butler [2001] for the approaches used to minimize this problem, which is now rare with modern STR typing techniques.

"Null alleles cause no problem for DNA profile interpretation provided that each null allele is consistently unamplified in repeat PCR assays. In that case, crime-scene and defendant profiles will correctly be recorded as matching *if the defendant is the true source of the crime-scene DNA*. This might be expected to occur if both crime scene and defendant samples were profiled in the same laboratory. Otherwise, differences in protocol, or use of PCR kits from different manufacturers, could generate a null allele in one laboratory that is non-null in another lab." (Balding, Weight-of-Evidence for Forensic Profiles (2005) p. 47, italics added.)

Finally, authors David Kaye and George Sensabaugh, the latter of whom testified in this case, state:

"[M]utations in the region of a primer can prevent the amplification of the allele downstream of the primer (null alleles). [¶] … [¶] *A null allele will not lead to a false exclusion if the two DNA samples from the same*

individual are amplified with the same primer system, but it could lead to an exclusion at one locus when searching a database of STR profiles if the database profile was determined with a different PCR kit than the one used to analyze the crime scene DNA." (Kaye and Sensabaugh, Modern Scientific Evidence: The Law and Science of Expert Testimony, *Scientific principles—How is DNA extracted and amplified?* (2012) § 31:41 & fn. 2, italics added.)[45]

b. When the Defendant is Guilty

We agree that allelic dropout does not appear to be an issue when the defendant *is in fact* the perpetrator. When the defendant is guilty, the evidence sample from the perpetrator (collected at the crime scene) and the reference sample from the defendant (collected later from the defendant to compare to the perpetrator's sample) originate from the *same* person and thus contain *identical* DNA. The two resulting profiles will be the same because the same template DNA is amplified with the same primers under the same conditions, and any allelic dropout that occurs due to any mutations in the template will occur identically in the two identical samples. Thus, the profiles will match, even if allelic dropout occurs, because the DNA in both samples is the same. Accordingly, allelic dropout will not lead to the false exoneration of a guilty defendant.

In a graphical representation of this scenario, we refer to both samples (the perpetrator's evidentiary sample found at the crime scene and the defendant's reference sample) as "perpetrator/defendant" (or "perp./def.") to emphasize that the perpetrator and the defendant are the same person. In this hypothetical, the genotype of the perpetrator/defendant is 14,19*, where 19* represents an allele that will not amplify because of a mutation in the primer binding site. The two identical DNA samples (from

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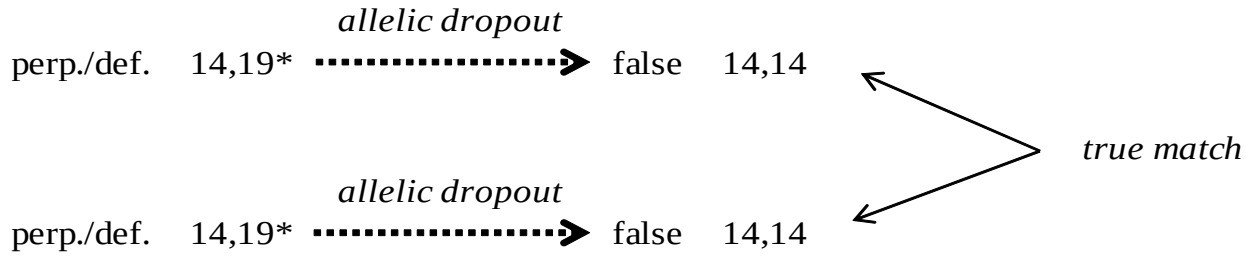
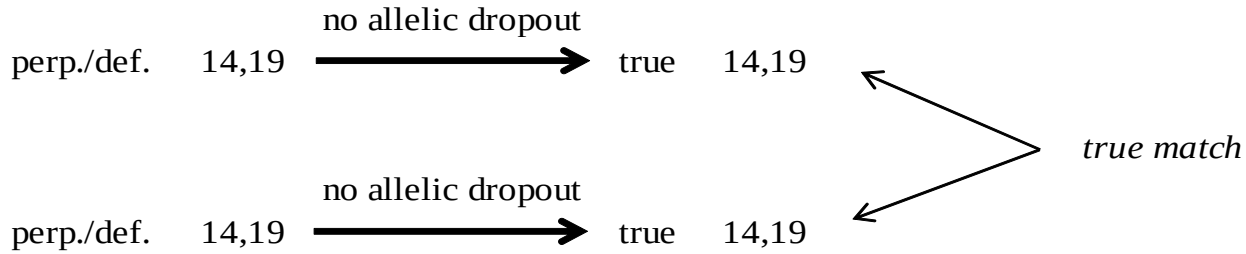
[45] Footnote * to this article states: "This chapter is abridged and adapted from the Federal Judicial Center, Reference Manual on Scientific Evidence (3d ed. 2011), with updates and commentary for 2012 provided by John Butler, Ph.D., of the National Institute of Standards and Technology." (Kaye and Sensabaugh, Modern Scientific Evidence: The Law and Science of Expert Testimony, *Scientific principles—How is DNA extracted and amplified?*, *supra*, § 31:41.)

the same person) both experience the same allelic dropout. And although the profiles both falsely appear homozygous 14,14 due to the dropout, they are inaccurate in the same way. Thus, the match is true, and the perpetrator/defendant is correctly incriminated:



And of course if no null allele is involved, for example, where the perpetrator/defendant is 14,19, and 19 represents a normal allele that will amplify and not drop out, the two identical samples will experience no allelic dropout. Both profiles will be true heterozygous 14,19 genotypes. The profiles are accurate, they match, and the perpetrator/defendant is correctly incriminated:



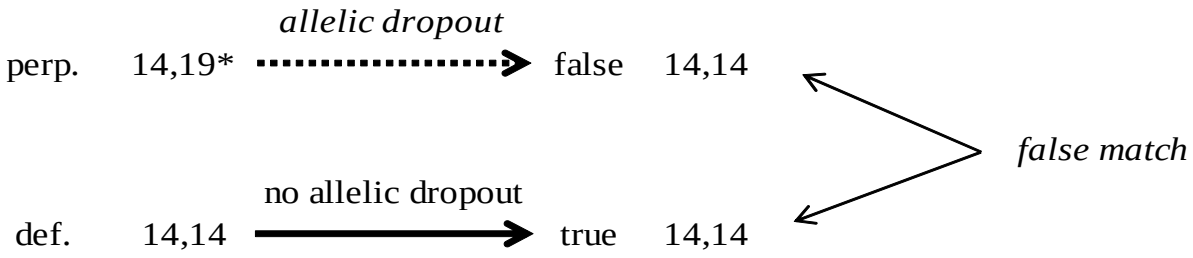
Accordingly, the theory propounded by Butler and others appears to be correct as far as it goes, which it seems to us is only as far as a guilty defendant.

c. When the Defendant is Innocent

But in cases where the defendant is *not* the perpetrator, the evidence sample from the perpetrator and the reference sample from the defendant originate from *different* people (because the defendant did not commit the crime and did not leave his DNA at the crime scene) and thus the samples contain *different* DNA. One sample may contain DNA with a mutation and the other sample may not. Allelic dropout may occur in one sample and not the other. Under these circumstances, allelic dropout in one sample may lead to a

false match that falsely incriminates an innocent defendant. It is this possibility, represented below, that addresses defendant's concern that the perpetrator in this case might actually have been heterozygous, but falsely appeared homozygous due to allelic dropout, and therefore falsely matched defendant's homozygous genotype.

If, as in the first scenario, the perpetrator is 14,19*, his mutant 19* allele will not amplify. The 19* allele drops out and his genotype falsely appears as a homozygous 14,14. But if now the defendant (who is a different person) is a true homozygous 14,14, he will be considered a match to the perpetrator's false homozygous 14,14. The defendant is included as a possible perpetrator, and he is falsely incriminated:



We have not found reference to this scenario in the literature, but it plainly suggests that allelic dropout is not always a benign phenomenon in criminal cases because not all defendants are guilty. Where the perpetrator and the defendant are different people and where one of them is mutant heterozygous and the other is normal homozygous, the dropout in the mutant heterozygous sample can cause a false homozygosity and a false match to the homozygous sample. This means, in theory at least, that allelic dropout is capable of leading to the conviction of innocent defendants. If our conclusions are accurate, the widely held idea that allelic dropout cannot cause false results in a criminal case as long as the same primers/kit are used on both the defendant's and the perpetrator's DNA samples is a very serious falsehood based on the improper assumption that the defendant is guilty.

d. "Recovery" of Null Alleles

The scientific community has devised methods to remedy allelic dropout by "recovering" a null allele that has dropped out due to a mutation in a person's primer binding site. (Recovery also includes routine preemptive practices that prevent a null allele from dropping out.) As Myers testified, "there are ways that people have tried to deal with [sequence variations that affect primer binding]."

The recovery of a null allele is based on restoring amplification *despite* a sequence variation in the primer binding site, usually by one of three methods. The first method uses a reduced annealing temperature during PCR. The reduced temperature lowers the stringency of the hydrogen bonds, thereby promoting binding between the primer and the mutant primer binding site, even though they do not match perfectly due to the mutation. With this change, the primer binds to the mutated primer binding site, *despite the mismatch*, and amplification will proceed.[46] The second method uses degenerate primers—a mixture of primers, one of which is specifically designed to match and bind to the mutant sequence.[47] The new primer binds to the mutated primer binding site, *because they match*, and amplification will proceed.[48] The third method uses an entirely

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[46] See, e.g., Butler 2005, *supra*, at pages 135 through 138; Butler 2001, *supra*, at page 92; Hendrickson et al., *Accurate STR Allele Designations at the FGA and vWA Loci Despite Primer Site Polymorphisms* (Mar. 2004) vol. 49, No. 2, J. Forensic Sciences, at pages 1 through 5 (reducing annealing temperature improved amplification of alleles with primer binding site mutations).

[47] The mutant sequence must be known for a new matching primer to be produced.

[48] See, e.g., Butler 2011, *supra*, at page 127 ("In some cases, STR kit manufacturers have added an additional PCR primer to the assay that can hybridize properly to the alternative allele when it exists in a sample. This has been the preferred solution for [ABI] …. According to their publications, [ABI] has added an additional primer to correct for single point mutations"); Butler 2009, *supra*, at pages 222 through 223; Butler 2005, *supra*, at pages 135 through 138; Butler 2001, *supra*, at page 92; Leibelt et al., *Identification of a D8S1179 primer binding site mutation and the validation of a primer designed to recover null alleles*, *supra*, at page 220 (addition of a degenerate primer fully

different primer that is designed to bind to a different site on the DNA, often just inside or outside of the mutated primer binding site. The different primer binds to the nonmutated primer binding site, *because they match*, and amplification will proceed.[49] In all three methods, the effect of the mutation in the primer binding site is eliminated—amplification of the allele occurs as if the mutation did not exist and the null allele is recovered.

Defendant argues that in this case efforts should have been made to recover a possible null allele in the perpetrator's DNA at the vWA locus to determine whether the perpetrator was actually heterozygous at that locus, rather than homozygous like defendant. If this had been the result, defendant would have been exonerated.

To represent this type of recovery, we again begin with the scenario in which the defendant is falsely incriminated because one of the perpetrator's alleles (the mutant 19*) dropped out:

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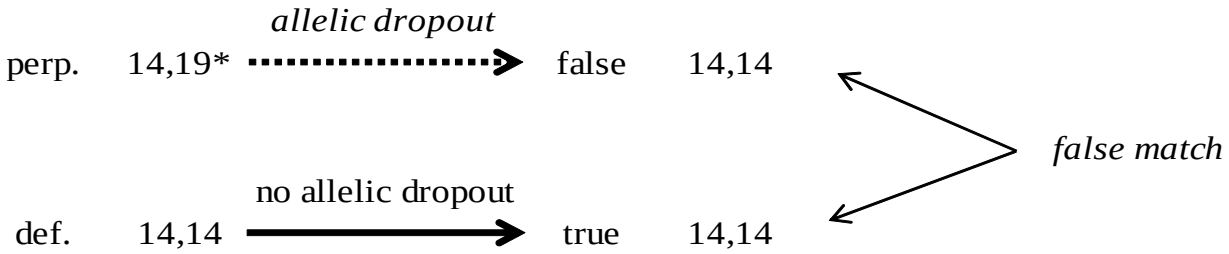
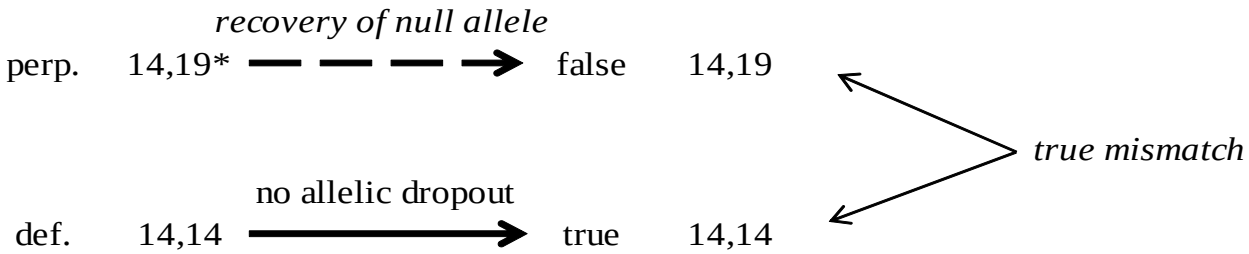
recovered the null allele in a sample with sequence variation); Leibelt, *supra*, at page 226 (ABI's Identifiler kit includes degenerate primers for the D8S1179 locus).

[49] See, e.g., Butler 2011, *supra*, at page 127 ("Promega has moved their primers to overcome allele dropout problems"); Butler 2009, *supra*, at pages 222 through 223.

The use of kits made by different manufacturers and containing different (proprietary) primer sets led to the discovery of null alleles. Now, concordance studies are conducted with different kits to discover more null alleles. If two kits containing different primers produce different (discordant) results from the same person's DNA (one kit producing a heterozygous genotype and the other producing a homozygous genotype), allelic dropout is suspected as the cause of the homozygous genotype. STRBase lists, for example, eight null allele incidents discovered at the vWA locus alone, four of which occurred using the Profiler Plus kit but not with another kit: loss of allele 19; loss of alleles 15 and 17; loss of allele 16; and loss of alleles 17, 18, and 19 (http://www.cstl.nist.gov/strbase under Null Alleles, as of May 17, 2013); see Butler 2011, *supra*, at pages 126 through 127.



If the perpetrator's mutant 19* allele is recovered, it will amplify and appear as a peak. The perpetrator's heterozygosity will be exposed (although the mutant 19* will appear to be a normal 19). The defendant, who is homozygous, no longer falsely matches the perpetrator, and the defendant is correctly exonerated:

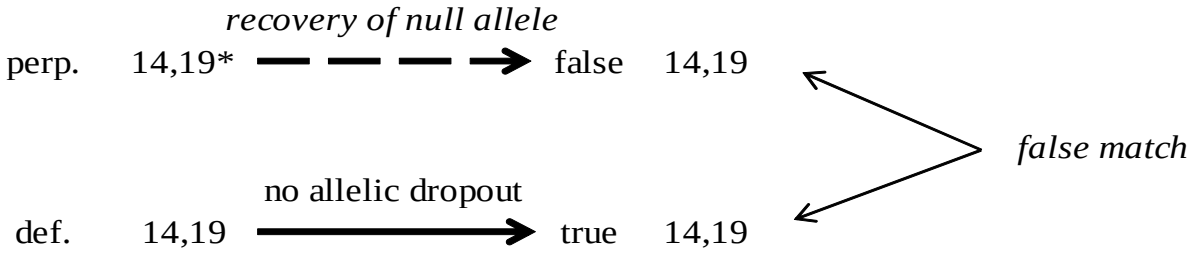


Thus, in this scenario—where one party is mutant heterozygous and the other is normal homozygous—the dropout causes a false match and the recovery reveals an exonerating mismatch. This is the exonerating null allele recovery to which defendant refers.

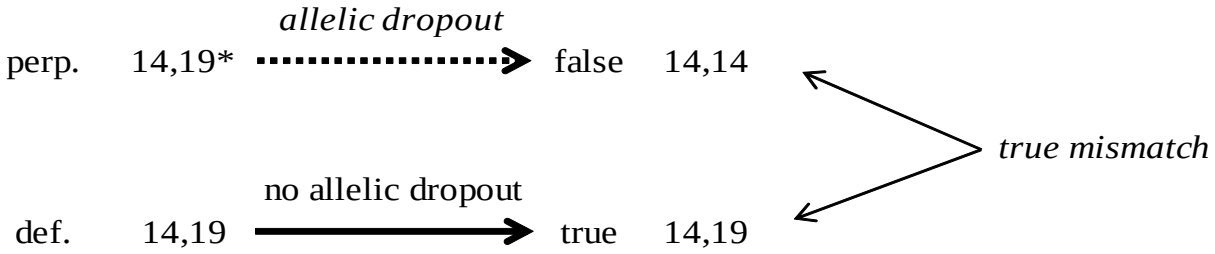
But we assume that null allele recovery can also lead to the opposite outcome—an incriminating false match—because the recovery itself masks a difference in sequence that might exonerate a defendant. The very point of null allele recovery is forcing the amplification of an allele *despite* a sequence variation. If recovery is performed *preemptively* on two samples that are both heterozygous—but one is normal and one is mutant—there is a risk of concealing a sequence difference that could have exonerated a defendant. We believe the following example demonstrates this possibility.

If, as before, the perpetrator's mutant 19* allele is recovered, it will amplify and appear as a peak, and the perpetrator will be considered heterozygous 14,19. But because now the defendant is heterozygous 14,19, he will be considered a match even though the

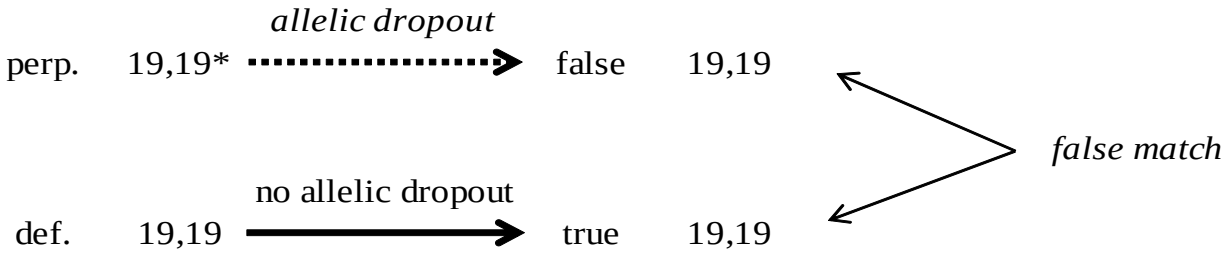
perpetrator has the mutation and the defendant does not. The preemptive null allele recovery has concealed the fact that the perpetrator's 19* allele has a *different sequence* than the defendant's 19 allele. If this difference in sequence means the two DNA samples come from different people, then this "match" falsely incriminates an innocent defendant:



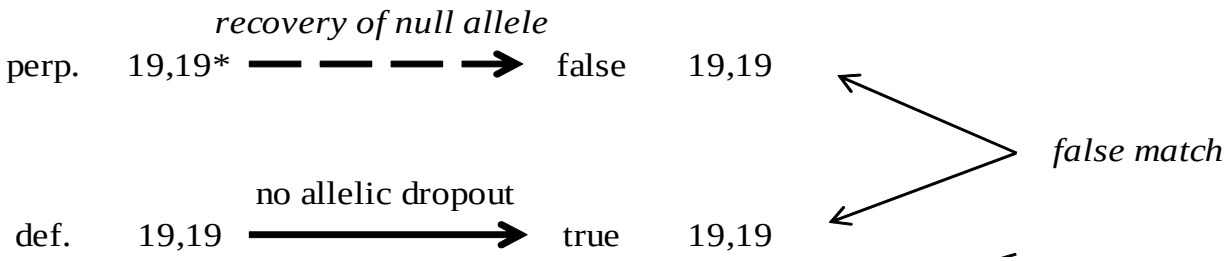
If instead the mutant 19* allele is not recovered, it fails to amplify and the perpetrator appears homozygous. The allelic dropout itself, which occurred *because* of a sequence variation, exonerates the defendant:



Apparently, recovery of a null allele can work in a defendant's favor if it happens to reveal a heterozygous genotype that exonerates him, or it can work against him if it happens to conceal a sequence variation that could have exonerated him. And it may do neither. In the following scenario, both allelic dropout and null allele recovery lead to the same false match, and the sequence variation simply goes undetected. If both parties are homozygous, but the perpetrator has a mutant 19* allele and the defendant has a normal 19 allele, allelic dropout occurs in one sample and the homozygous genotypes match even though one person has a mutation and the other does not:



If the null allele is recovered, the perpetrator is still homozygous, the mutation is still masked, and the genotypes still falsely match:



These various scenarios demonstrate the limitations of the STR system that result from its inherent inability to determine allele sequence. And they raise the issue of whether null allele recovery should be conducted in criminal cases and, if so, under what circumstances. The prospect that null allele recovery can reveal a heterozygosity that exonerates a defendant suggests that recovery should be attempted when an analyst observes a homozygous genotype that raises suspicions that a second allele has dropped out. But the risk that null allele recovery can mask a sequence variation that could have exonerated a defendant suggests that recovery should not be a routine, preemptive practice in criminal cases (i.e., with the routine use of reduced annealing temperatures and/or degenerate primers). On the other hand, preemptive null allele recovery could be viewed simply as a means of restoring the ability of the STR system to measure alleles by length without regard for sequence. Alleles with variations in the primer binding site would join ranks with alleles with variations inside the STR allele itself. They all would be measured by length and all of their sequence variations would go undetected. Presumably, the same rationale for tolerating the possibility of an allele matching in length but not in sequence would apply to both types of variations: a sequence variation

is extremely unlikely to exist in a person whose alleles match in length at a certain number of loci.

We see the obvious value of null allele recovery in parentage and other familial testing (e.g., to identify parents, missing children, ancestors, and the remains of victims), which relies on the elucidation of familial relationships *despite* mutations that might have occurred between generations. And we see the value of null allele recovery when comparing DNA profiles that have been created with different primer sets (e.g., kits from different manufacturers). But we think the value of null allele recovery within a criminal case—where the purpose is to determine whether two DNA samples come from *the same person*—is a more complicated issue. If the ultimate test of identity between two DNA samples is the identity of their sequences, then methods that suppress or mask sequence differences may not be appropriate in the criminal context.

It is our hope in discussing these issues that the scientific community will reexamine the possible effects and management of allelic dropout in criminal cases and determine how best to safeguard the innocent while incriminating the guilty.

e. The Present Case

In this case, Myers's opinion was that allelic dropout would not cause a false result because "the person who would have that sample would still type as this same result using this kit. So as long as everyone is typed with the same kit there wouldn't be any false result because the result will be the same." Myers did not expressly refer to the samples coming from the same person, as Butler and the other authors do in the excerpts above. But if Myers's opinion was also based on the assumption that defendant and the perpetrator were the same person—that defendant was guilty—then it was based on an incorrect legal theory. And, if so, the opinion did not constitute substantial evidence that allelic dropout did not cause, or could not have caused, a false match in this case. (*Corrales v. Corrales* (2011) 198 Cal.App.4th 221, 226 ["An expert's opinion that assumes an incorrect legal theory cannot constitute substantial evidence"]; *Exxon Corp.*

v. Superior Court (1997) 51 Cal.App.4th 1672, 1683 ["court is not bound by an expert opinion that is speculative or conjectural or that is based on an incorrect legal theory"]; *Pacific Gas & Electric Co. v. Zuckerman* (1987) 189 Cal.App.3d 1113, 1135 ["The value of opinion evidence rests not in the conclusion reached but in the factors considered and the reasoning employed"; "Where an expert bases his conclusion upon assumptions which are not supported by the record, upon matters which are not reasonably relied upon by other experts, or upon factors which are speculative, remote or conjectural, then his conclusion has no evidentiary value"]; see also *Sargon Enterprises, Inc. v. University of Southern California* (2012) 55 Cal.4th 747, 771 ["'A court may conclude that there is simply too great an analytical gap between the data and the opinion proffered'"].)

Assuming, without deciding, that Myers's opinion was flawed and the trial court abused its discretion in not excluding it, we consider whether it is reasonably probable that the verdict would have been more favorable to defendant in the absence of the error. (*People v. Prieto* (2003) 30 Cal.4th 226, 247 [erroneous admission of expert testimony reviewed under *Watson* standard]; *Venegas, supra,* 18 Cal.4th at p. 93; *Watson*, *supra*, 46 Cal.2d. at p. 836.) Had the trial court excluded Myers's opinion, the remaining evidence on this topic would have constituted the following: The sperm fraction electropherograms showed single peaks at three loci—vWA, TPOX, and CSF1PO. Myers explained that all of these single peaks were of great enough height that he saw no reason to suspect, based on peak height, that a second allele had dropped out.[50] He also noted that although some degradation of the DNA had occurred in this case, it was not sufficient to concern him. Furthermore, allelic dropout is a rare phenomenon, occurring at a frequency of about 0.1 percent.[51] Even without Myers's potentially flawed opinion,

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50 The single peaks at the vWA, TPOX, and CSF1PO loci were over 8,000 RFU, over 1,200 RFU, and over 500 RFU, respectively.

51 We note that STRBase lists the frequency of reported primer binding site mutations causing null alleles at the STR loci. Some mutations were found to appear as

we believe this remaining evidence was sufficient to establish that Myers considered the possibility of allelic dropout, looked for signs suggesting it might have occurred, and concluded, based on his experience and observations, that it had not occurred here and that the single peaks represented true homozygous genotypes.

If, however, Myers did not follow correct scientific procedure in his analysis of the possibility of allelic dropout and thus the trial court should have excluded the evidence of the single peaks at the three loci because allelic dropout could have occurred at those loci, we would still conclude the court's failure to exclude that evidence was harmless. If the three apparently homozygous loci had not been considered because their single peaks were inconclusive based on the possibility of allelic dropout, the remaining loci still would have constituted a 10-loci match that still would have produced astronomically rare statistics and still would have been extremely incriminating. Defendant could argue he might not even have matched at those three loci if allelic dropout had occurred at any one of them and therefore they cannot just be ignored. But it is always true that a match might not occur at additional loci if they are tested, even if that possibility is extremely unlikely in light of many loci already matching. The argument, however, is speculative and does not change our conclusion.

In summary, if Myers's opinion was improperly based on the assumption that defendant was guilty, any error in admitting the opinion was nevertheless harmless. Other evidence showed that allelic dropout had probably not occurred at the three apparently homozygous loci. Furthermore, even if evidence of the three apparently homozygous loci should have been excluded, a 10-loci match would have been extremely

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frequently as three in 110 and some as infrequently as one in 18,314. (http://www.cstl.nist.gov/strbase under Null Alleles, as of May 17, 2013.) The website also lists mutation rates of each of the core STR loci as ranging from 0.01 percent to 0.28 percent. (http://www.cstl.nist.gov/strbase under Mutation Rates for Common Loci, as of May 17, 2013.)

incriminating, even though less so than a 13-loci match. We conclude there is no reasonable probability of a more favorable verdict without Myers's opinion and even without the three apparently homozygous loci. Any error was harmless. (*People v. Prieto, supra,* 30 Cal.4th at p. 247 *Venegas, supra,* 18 Cal.4th at p. 93; *Watson, supra,* 46 Cal.2d. at p. 836.)

III. AGREEMENT OF FACTS COMPRISING MURDER*

The trial court instructed the jury on two theories of first degree murder: premeditation and felony murder. Defendant contends the trial court violated his Sixth Amendment right to a jury trial when it permitted the jury to convict him of murder without agreeing on the facts that comprise the offense.

In *Schad v. Arizona* (1991) 501 U.S. 624, 630-645 (*Schad*) and *Walton v. Arizona* (1990) 497 U.S. 639, 648 (*Walton*), overruled on another ground by *Ring v. Arizona* (2002) 536 U.S. 584, 609 (*Ring*), the United States Supreme Court held that federal courts would defer to states' definitions of the elements of offenses, and juror unanimity was not required as to the factual theory for a conviction. The California Supreme Court has explicitly held that "jurors need not unanimously agree on a theory of first degree murder …." (*People v. Nakahara* (2003) 30 Cal.4th 705, 712 (*Nakahara*).) Defendant argues that the United States Supreme Court's decisions in *Apprendi v. New Jersey* (2000) 530 U.S. 466 (*Apprendi*) and *Ring* have undercut the basis for *Nakahara.*

In *Ring,* the court overruled *Walton* "to the extent that it allows a sentencing judge, sitting without a jury, to find an aggravating circumstance necessary for imposition of the death penalty." (*Ring, supra,* 536 U.S. at p. 609.) However, neither *Ring* nor *Apprendi* mentioned *Schad.* Furthermore, in *Nakahara,* the California Supreme Court rejected the argument that *Apprendi* called into question former rulings that unanimity instructions are not required when a jury is instructed on different theories of first degree murder.

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* See footnote, *ante,* page 1.

The court explained that in *Apprendi,* "the United States Supreme court found a constitutional requirement that any *fact* that increases the maximum penalty for a crime, other than a prior conviction, must be formally charged, submitted to the fact finder, treated as a criminal element, and proved beyond a reasonable doubt. [Citation.] We see nothing in *Apprendi* that would require a unanimous jury verdict as to the particular *theory* justifying a finding of first degree murder. (See also *Ring*[, *supra,*] 536 U.S. [at p. 610] [requiring jury finding beyond reasonable doubt as to *facts* essential to punishment].)" (*Nakahara, supra,* 30 Cal.4th at pp. 712-713; see also *People v. Quiroz* (2013) 215 Cal.App.4th 65, 73-76.) In *People v. Hawthorne* (2009) 46 Cal.4th 67 at page 89, overruled on another point in *People v. McKinnon* (2011) 52 Cal.4th 610 at page 637, the court reaffirmed that a unanimity instruction is not required when two theories of first degree murder are presented.

We are bound by *Nakahara* and *Hawthorne* (*Auto Equity Sales, Inc. v. Superior Court* (1962) 57 Cal.2d 450, 455), and therefore we reject defendant's contention that the jury should have been instructed on unanimity as to the theory of murder.

DISPOSITION

The judgment is reversed.

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Kane, Acting P.J.

WE CONCUR:

_____
Poochigian, J.

_____
Franson, J.